UCLouvain

LOUVAIN
School of Management

Louvain School of Management

# An Analysis of the External Innovation Strategies of Pharmaceutical Companies to Strengthen Their Product Portfolios

Author : Tomas Cuyx
Promotor : Prof. Eric Cornuel
Academic year: 2025 -2026
Travail de fin d'études (TFE) en vue d'obtenir le titre de
Master en gestion
Horaire décalé

Abstract:
The global pharmaceutical industry faces a structural innovation crisis. Declining internal R&D productivity (Eroom's Law) and tightening reimbursement regimes compress profitability. In response, companies have increasingly shifted from organic R&D toward inorganic growth through M&A and licensing. This creates a paradox: while M&A has become imperative for survival, empirical evidence shows a substantial share of pharmaceutical M&A fails to generate long-term shareholder value, often coinciding with reduced R&D spending.
This thesis investigates how pharmaceutical companies strategically structure external innovation transactions to optimize product portfolio risk across therapeutic areas while sustaining long-term value creation. A qualitative, multi-case study design was adopted, analyzing five post-COVID transactions (2022–2026) spanning North America, Europe, and Japan: four full acquisitions (Pfizer/Seagen, Astellas/Iveric Bio, BMS/Karuna Therapeutics, Roche/Carmot Therapeutics) and one licensing collaboration (Merck/Daiichi Sankyo). For each case, pre- and post-deal product portfolios were reviewed, together with the public financial disclosures and industry reports, to find the strategy being taken by pharmaceutical companies for external innovation.
Findings show that there is no unified M&A strategy, but rather three largely independent levers. The *governance structure* (acquisition versus licensing) determines how financial risk and reward are shared; this sample did not confirm recent findings that licensing systematically outperforms M&A. *Asset-stage risk* at signing which is linked with the financial structure of the deal. It can de-risk clinical outcomes, but it does not eliminate commercial or regulatory risk. The *therapeutic-area strategy* (deepening an existing franchise versus diversifying) broadly confirmed that diversification carries higher execution risk, though one case shows this can be managed successfully when driven by a deliberate market entry rather than a short-term response to Loss of Exclusivity.
The most robust transactions combined clear product synergies or well-timed market entry, while deals structured to urgently offset loss of exclusivity were shaped more by opportunity than by coherent strategic planning. Given the limited sample, these findings offer insights rather than statistically representative conclusions.

**UNIVERSITÉ CATHOLIQUE DE LOUVAIN**
**Louvain School of Management**
Place des Doyens, 1 bte L2.01.01, 1348 Louvain-la-Neuve
Boulevard Emile Devreux 6, 6000 Charleroi, Belgique
Chaussée de Binche 151, 7000 Mons, Belgique
**www.uclouvain.be/lsm**

# TABLE OF CONTENTS

# LIST OF ABBREVIATIONS

| | |
|---|---|
| AI | Artificial Intelligence |
| BLA | Biologics License Application |
| BMS | Bristol Myers Squibb |
| CRO | Contract Research Organization |
| CVR | Contingent Value Rights |
| EBITDA | Earnings Before Interests, Taxes, Depreciation and Amortization |
| EMA | European Medicines Agency |
| FDA | Food and Drug Administration |
| FY | Fiscal Year |
| HTA | Health Technology Assessment |
| IRA | Inflation Reduction Act |
| IRR | Internal Rate of Return |
| M&A | Mergers and Acquisitions |
| NHS | National Health Service |
| NIH | National Institutes of Health |
| NIHDI | National Institute for Health and Disability Insurance |
| NME | New Molecular Entity |
| QALY | Quality-Adjusted Life Year |
| R&D | Research and Development |
| WACC | Weighted Average Cost of Capital |

# LIST OF TABLES, GRAPHICS AND ANNEXES

**Tables**



**Graphics and figures**



**Annexes**

No annexes are included in this dissertation.

# 1.INTRODUCTION

## 1.1. MARKET DYNAMICS OF THE PHARMACEUTICAL INDUSTRY

### 1.1.1. The Global Economic Landscape

The global pharmaceutical industry is a constantly growing industry. Between 2016 and 2025, total global medicine spending grew by 74.8% versus an inflation of 39.1% (IQVIA, 2026), (https://data.worldbank.org/indicator/, 2026). In 2025, the global pharmaceutical market was worth USD 1.9 trillion (1.7 trillion euros). According to the IQVIA report on Global Medicine Use Trends of 2026 (IQVIA, 2026), growth is forecasted at 5-8% per year (see Figure 1).

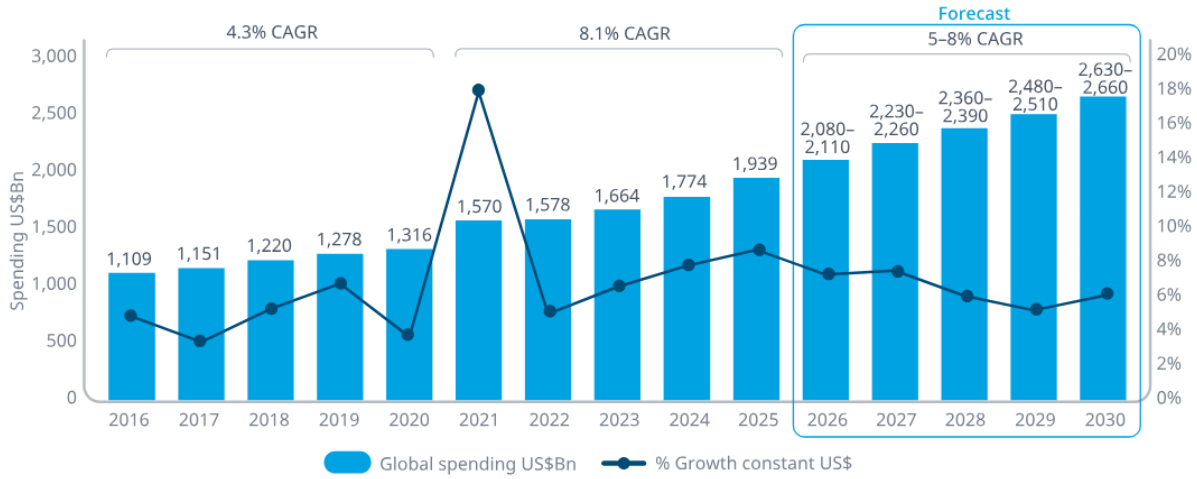


*Figure 1: Global medicine market size*

Although the largest market remains the United States (which contributes around 50% for the growth (IQVIA, 2026), access to pharmaceuticals in emerging markets is growing. Other reasons for the growth are the change from easy to produce chemical molecules to expensive biological medicines and cell therapy, and the fact that the population is ageing and has a more sedentary lifestyle, leading to an increase in chronic diseases (González Peña et al., 2021).

### 1.1.2. The Technological Pivot

#### *1.1.2.1 Biologics and Cell Therapy*

As evidenced by Figure 2, the pharmaceutical industry is undergoing a transformation. While the number of new molecular entities (NME), small molecules that are cheaper to

produce, approved by the Food and Drug Administration (FDA) remains stable, more and more Biologics License Applications (BLA), medicines with higher production costs, because biologics exhibit significantly greater production variability, are being approved (Congressional budget office (US congress), 2021).

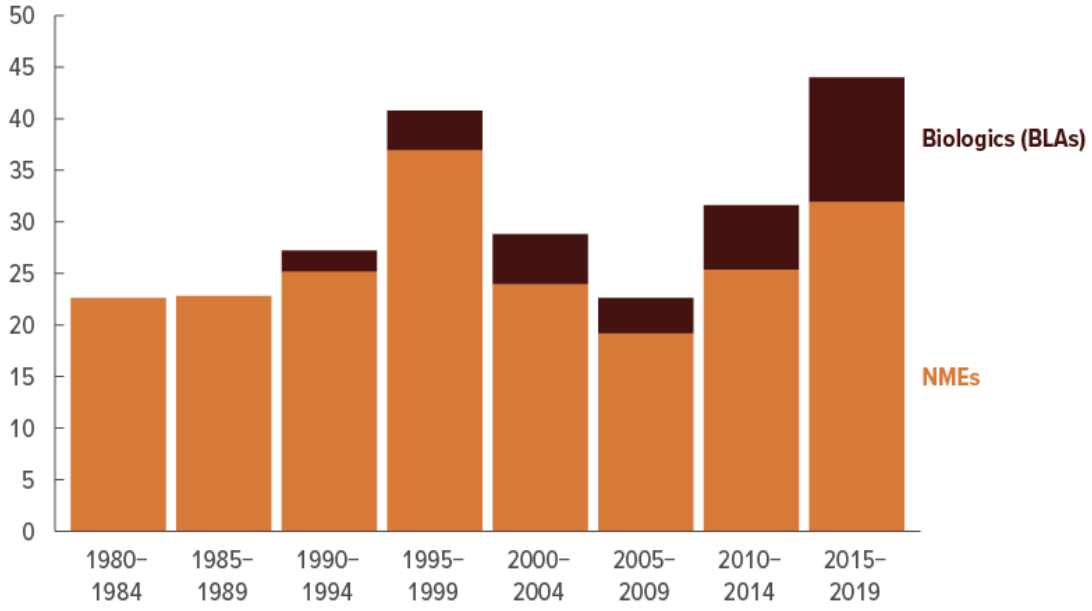


*Figure 2: FDA annual new drugs approved (Congressional budget office (US congress), 2021)*

With this increase in BLAs, the R&D spending has exponentially increased.

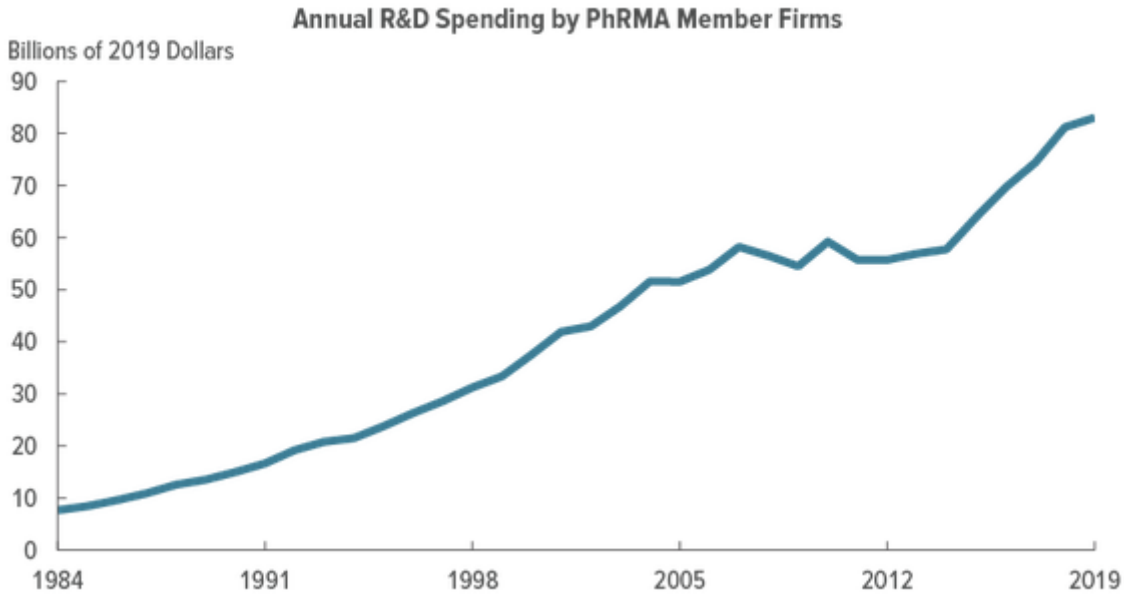


*Figure 3: Annual US R&D spending (Congressional budget office (US congress), 2021)*

#### *1.1.2.2 Artificial intelligence in R&D*

While Artificial Intelligence (AI) has experienced a major boom accross all sectors of industry and society. In the pharmaceutical industry AI has also become embedded in the R&D process. AI is used in all phases of the lifecycle of medicines:

- The regulatory and reimbursement dossier can be written much quicker
- The clinical studies can be set up with minimal technical overhead
- Marketing materials can be made much more efficiently
- …

One major breakthrough though is the use of generative AI systems in the drug discovery and the development of new molecules. In the last decade, massive datasets have been created, based on progress in genomics, chemical informatics. These could be used by statistical prediction algorithms to find the ultimate adaptation of the molecule so that it binds perfectly with the target protein, while also having a favorable administration, distribution, metabolism, excretion and toxicity profile (so in summary, that the medication gets absorbed in the blood, and can act on the organ or the cells where it has to act, and can be excreted by the body without causing toxic reactions).

In recent years, these statistical models are gradually being replaced by Machine Learning and Deep Learning. While for statistical models, molecules could be tested 'in silico', the AI models can propose new molecules that could be tested on animals, based on the failure or success of previous molecules, and based on the massive datasets (Iqbal et al., 2026; Zhou & Tao, 2026).

Another area where AI has made huge progress in the research is in proteomics. Where previously, to calculate the 3D structure of proteins, it required months and months of raw computational power, with AI, this process is shortened to a couple of hours. This makes it much easier to identify targets and to simulate protein-drug interaction, or to know what to target for people with a genetic disease and consequent protein malformations (Iqbal et al., 2026).

At the moment, there are though some challenges that make that it cannot be fully used as it should be for the moment. AI models are limited by the quality of available datasets (which often give contradictory results). Also AI is a black-box, which might undermine interpretability, and requires costly pre-clinical experiments to confirm the prediction (Zhou & Tao, 2026).

However, the recent advancements in AI are projected to reduce the early-stage drug discovery timelines by 30-50% while lowering costs by up to 25% over the next 5 years.

Until now though, the AI models have not allowed better predictability on which medication will survive the (pre-)clinical tests and the regulatory requirements. This could cause more candidate drugs to go to the pre-clinical phase, increasing spending in R&D.

### 1.1.3. R&D Productivity Crisis

#### *1.1.3.1 Eroom's Law: The Exponential Decline in Innovation Efficiency*

In 1965, Gordon Moore hypothesized that the number of transistors on a chip could double every 2 years. This hypothesis has still held more or less. In 2012, Scannell et al. coined another hypothesis, that the number of drugs approved per billion dollars of R&D has roughly halved every nine years since the 1950s. They named the hypothesis in reference to Moore's law by reversing the name to the Eroom's law (Scannell et al., 2012). Main reasons are that for market access of first drugs in a category, the drug needs to be better than placebo. For new drugs with the same indication, greater efficacy needs to be demonstrated compared to the best-in-class treatment. Furthermore, after several scandals like the Thalidomide scandal, the regulatory agencies have raised the bar for pharmaceutical companies for new approvals (Scannell et al., 2012).

#### *1.1.3.2 Escalating costs of drug development*

While the average R&D cost to develop a drug from discovery to launch has increased from 1.296 billion dollars in 2013 to 2.671 billion dollars in 2025, the average forecasted peak sales per pipeline asset stayed stable between 2013 and 2025 and would even decline if the immense blockbusters of GLP-1 medication would not be counted.

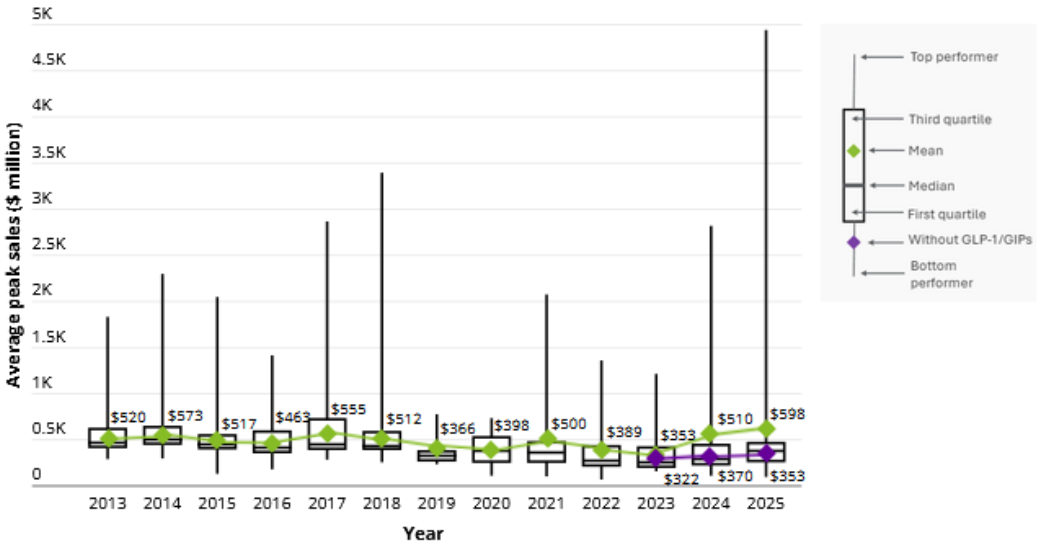


*Figure 4: Sales per pipeline asset (Deloitte, 2026)*

This graph shows that without taking the GLP-1 drugs into account, the average sale per drug has decreased a lot. The top performer shows though that a small number of medicines ensure a substantial part of the revenue

#### *1.1.3.3 Decline in Internal Rates of Return*

Because of rising R&D costs and stabilizing sales, the Internal rate of return (IRR) has taken a hard hit. Without the GLP-1 blockbusters, the IRR in 2025 was around 3%, while this was still at 6.5% in 2013 (Deloitte, 2026). This IRR is below the Weighted Average Cost of Capital (WACC) which is typically between 7 and 9% for pharmaceutical firms. Based on Figures 4 and 5, we see that the proportion of revenue from blockbuster products (top performer) is increasing relative to average product revenues. In 2025, 70% of revenue from the top 20 pharmaceutical companies came from blockbusters. This shows that a small number of assets can lift the ROI, but higher risks need to be taken to find this new blockbuster (Deloitte, 2026).

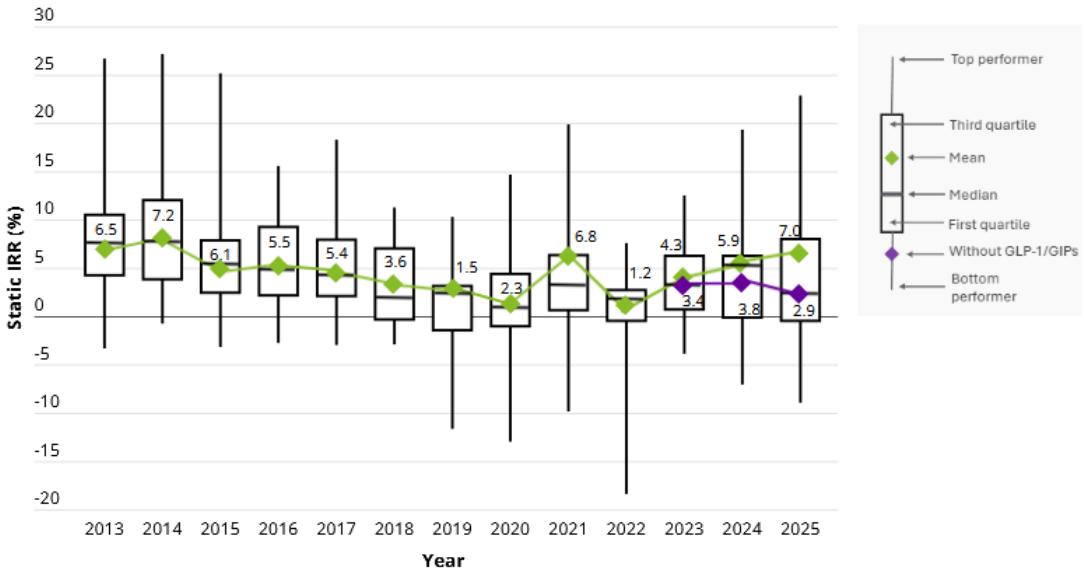


*Figure 5: IRR distribution for new medicinal products (Deloitte, 2026)*

While the mean IRR has grown in 2025 to 7%, this is mainly due to the highly successful GLP-1 drugs. Without this, the mean IRR would be only at 2.9%, much lower than the cost of capital.

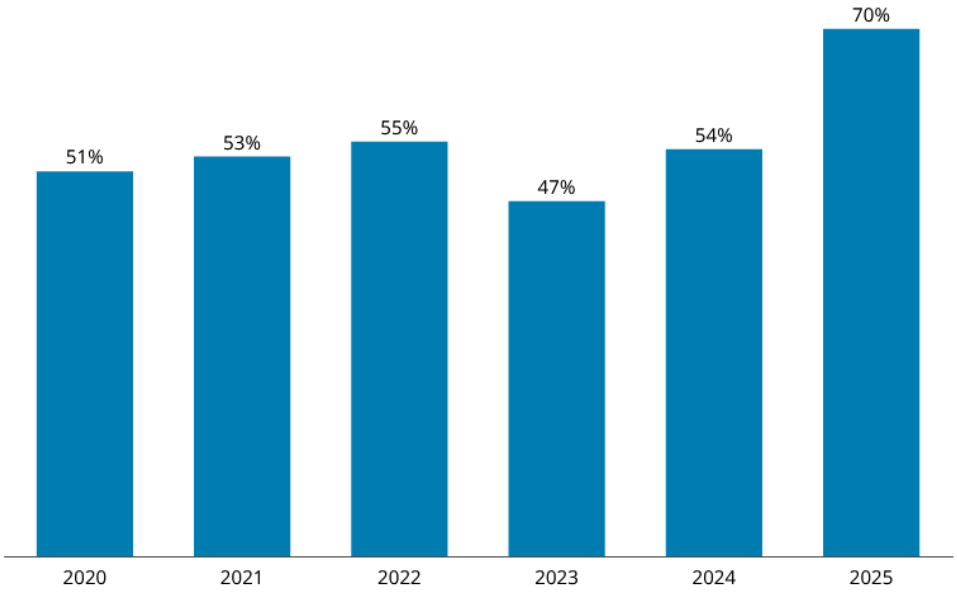


*Figure 6: Proportion of revenue from blockbusters in the late-stage pipeline of the top 20 companies (Deloitte, 2026).*

In 2025, 70% of the revenue came from blockbusters. A small amount of highly successful pharmaceuticals are ensuring the profitability of these companies

### 1.1.4. Regulatory Pricing and Reimbursement Stresses

#### *1.1.4.1 Reimbursement approval*

After having proven that the medication is at least as efficacious and safe as its main competitor, an authorization for the market can be granted. However, this authorization does not guarantee that the medication can be marketed. With a lot of novel therapies that have a high cost (e.g. Keytruda, a novel biological checkpoint inhibitor used as immunotherapy for different kinds of cancers costs €112.000 per year in Belgium), pharmaceutical companies can request reimbursement from the social security in the different countries (Pharma.be, 2025).

To get reimbursement in the different countries (the reimbursement procedures are completely national; there is no European procedure), a Health Technology Assessment (HTA) is performed. The efficiency of the medication is quantified in Quality Adjusted Life Years (QALYs). A medicine that increases the average life with one year in full health, gives one QALY. The social security of the different countries will assess if it is appropriate to reimburse the medication by weighing the costs versus the QALY (Richardson & Schlander, 2019). In the UK for example, the National Health Service (NHS) puts a limit on 25.000 to 35.000 pounds per QALY (National Institute for Health

and Care excellence, 2025). This amount is around the same as for other Western European countries.

The reimbursement procedure in the United States differs substantially as companies negotiate with the different private insurance companies. This allows pharmaceutical companies to sell their medicine at 100.000 to 150.000 USD per QALY (Neumann & Kim, 2023).

#### *1.1.4.2 The Belgian Market: Budgetary Caps, Claw-Backs, and Category Shifts*

Belgium is following a system where the medication is reimbursed by the National Institute for Health and Disability Insurance (NIHDI), after the analysis of an HTA, to judge if the medication is providing enough efficacy compared to the cost. The NIHDI budget for the reimbursement of medicines is increasing year after year. In 2024, this was at 7.9 billion euros, around 9.6% more than in 2023.

Of those 7.9 billion euros, 68% was attributed to the reimbursement of 15 classes of medication (of 168) of high-impact medicines, with monoclonal antibodies (under which Keytruda for different kinds of cancer immunotherapy) topping the charts with a cost of 1.3 billion euros to the Belgian taxpayers. This shows that although more and more money is made in the pharmaceutical industry, it is concentrated to a couple of medicines (NIHDI, 2024).

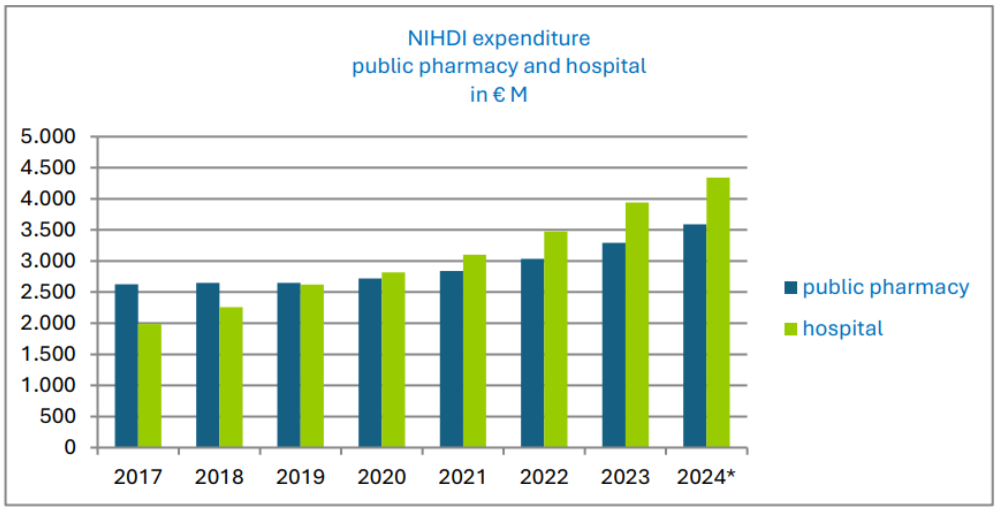


*Figure 7: NIHDI expenditure to public pharmacy and hospitals (NIHDI, 2024)*

This figure shows an exponential growth of the expenditure of the Belgian government on pharmaceuticals, showing that future savings on the drug spendings will arrive.

To combat these exploding prices, the Belgian legislator has put clawback mechanisms in law (Law of 18 december 2016 art 20). A pharmaceutical company who sells more of

its product than initially budgeted during the reimbursement procedures, needs to pay a certain percentage (maximum 4% of the global pharmaceutical budget) back to the government. The exact reimbursements and clawback percentage is subject to secret contracts between the pharmaceutical companies and the government. However, globally, the NIHDI can recuperate 2.3 billion euros of the 7.9 billion euros due to a combination of clawbacks and taxes (NIHDI, 2024).

#### *1.1.4.3 The United States Market: The End of Price Freedom with The Inflation Reduction Act*

Meanwhile in the US, the pharmaceutical companies were much more free to decide on the prices, and were negotiated directly with private insurance companies in secret contracts. This made for some huge scandals; in 2015, Turing Pharmaceuticals bought the market authorization of Daraprim, a medicine to treat toxoplasmosis in immune-compromised patients, and overnight, the CEO (Martin Shkreli) increased the price from $13.50 per pill to $750, making for a life-saving therapy for certain patients of a couple of hundred thousands of dollars per year, so completely unpayable for the average American (Allhoff, 2015).

This and many other scandals with life-saving drugs, like insulin, have created a call to cap the medicine prices and not treat medicinal products as normal market goods, only subject to capitalistic market dynamics. In 2022 the Biden administration implemented the inflation reduction act (IRA). This act made it possible for the government to cap prices of medication that are covered by Medicare (Cubanski & Neuman, 2026).

While the IRA is covering only a couple of high-interest drugs, in recent years, President Donald Trump has also targeted high pharmaceutical prices. With the Most-Favoured Nation law, the US wants to align the drug prices in the US with the lowest price of the OECD countries (Credendo, 2025). This would be a shocking change for the pharmaceutical industry, as the US is accounting for about 50% of medicine sales, although they only account for 13% of total volume of prescription drugs (Parasrampuria S & Murphy S, 2024).

Furthermore, the new US administration has announced hefty tariffs on medicines that are produced outside of the US from 15% (for the EU and Japan) up to 100% for some countries that do not have a trade agreement (like India or China). Since the first tariffs have been announced, the imposition has changed constantly, where a country that does something against the US interests can have a sudden increase in tariffs. This unpredictability is a strain on the pharmaceutical industry, and while some companies

combat this by building US infrastructure, others are paying part of the tariffs and ask higher prices to the US patients, while hoping for a next administration that is less isolationist (Credendo, 2025).

## 1.2. EVOLUTION OF R&D STRATEGIES

### 1.2.1. From closed R&D to open innovation

#### *1.2.1.1 General*

Closed R&D is the traditional process of innovation in companies where the R&D functions are centrally organized and embedded in the company's strategy. Those R&D facilities were powerhouses in extracting knowledge by highly investing in these R&D centers. This has led to numerous inventions and patents, which helped the companies to establish quasi-monopolies, since innovations are not shared and protection of intellectual property is very high.

In recent decades, this closed innovation has become obsolete in several industries. The reason of this can be attributed to different factors:

- Increasing availability and mobility of skilled workers: more and more college graduates became available on the employee market and they are more and more mobile. Companies with a strong internal R&D department can see their employees being hired by the highest-bidding competitor. This competitor buys access to the information of the R&D department of the previous employer.
- Explosion of Venture Capital investments: Since the 1980s, the investments in Venture Capital have exploded. They are injecting large sums of money in new enterprises, giving them the opportunity to buy up the top talents of large firms with large internal R&D departments.
- Other options for unused ideas: because research findings do not get immediately developed into commercial ideas, for example because the development department is not ready to use this, disillusioned employees could find other ways of commercializing their ideas, possibly by using Venture Capital.
- External suppliers become more and more capable: This is helping the industrial innovation by being able to shorten R&D time, but those suppliers are available to all other companies.

The closed innovation is replaced by open innovation, where external knowledge is used to complement the internal R&D department and more and more information is shared with the exterior (Chesbrough, 2003).

#### *1.2.1.2 Open innovation in the pharmaceutical industry*

While historically, due to high regulatory requirements, and because profits are highly dependent on intellectual property, R&D departments in the pharmaceutical industry were mostly in-house, recently, some initiatives to open up the R&D were started as identified by Schuhmacher et al (Schuhmacher et al., 2018):

- Crowdsourcing: Pharmaceutical companies often get information on drug targets via non-profit and government organisations. One well-known example is the human genome project, where the US Department of Energy and the National Institutes for Health with other global contributions have spent 13 years to unravel the human genome. This information has accelerated the study of human biology and helped identifying biological targets for medication (National Human Genome Research Institute, 2024). Pharmaceutical companies have also started their own crowdsourcing platforms, to share innovative ideas. For example, AstraZeneca has a platform openinnovation.astrazeneca.com, that provides access to innovative discovery technologies. Researchers can also add their investigation data that AstraZeneca can use.
- Public Private Partnerships: These are business ventures, financed and operated by a partnership of academic or publicly funded institutions as the Bill and Melinda Gates foundation with pharmaceutical companies. They are mainly focused on high unmet medical needs for which the pharmaceutical industry is less active, or for which high development costs are not profitable.
- Pharma Innovation centers and research alliances: Lots of pharma companies started their own innovation centers, where they work together with academic centers, or open up the laboratory for start-ups. An example is Astellas Pharma SakuLab which is a laboratory in Astellas' Tsukuba research center which gives access to start-ups or academic researchers to do their research there and to profit from the presence of Astellas' development scientists (Astellas Pharma, 2026).
- Virtualization of R&D to increase efficiency: Companies lower the R&D costs by transferring services that are not often done to partner companies. The goal is to leverage economy of scale. Numerous contractors, called Contract Research Organisation (CRO) exist and help small and larger pharma companies to run parts of their R&D program.

In conclusion, lots of pharmaceutical companies are tapping into one or more ways of open innovation, by partnerships with start-ups or academia, by opening innovation

centers, or by outsourcing parts of their R&D programs. In large pharma companies though, this often limits itself to research areas which will not lead to the potential blockbusters (Schuhmacher et al., 2018).

### 1.2.2. Organic vs Inorganic growth

#### *1.2.2.1 Product-market strategy*

The main objective of the pharma company, as with other companies is to remain in business. To do so, besides providing value to their patients, steady growth is necessary to be able to share profits to the shareholders. A well-thought product-market strategy is needed to fulfill this growth. In general, four different types of product-market strategy exist (Ansoff, 1957):

- Increased market penetration: the volume of sales increases within the same product portfolio by finding new customers. In the pharma industry, this would translate to the sales activities: visiting medical professionals, presenting on conferences, providing extra promotional material, showing the product is safe, efficient, …
- Market development: the company adapts its present product line to answer new problems for the clients. In pharma, this can be done in different ways. The dosage or the way of administration can be changed, to be able to provide the medication to other patients (for example children). New tests with the same product can be done as well to show the regulators that the product can be used in new indications.
- Product development: the company tries to find new, better, products for the same problem. In the pharma industry, this would mean looking at the same target in the human body, but improving the molecule to be more efficient, safer or easier to administer.
- Diversification: the company enters completely new markets. In pharma, this would mean exploring new drug targets for different disease areas.

Diversification, and product development is very important in the pharmaceutical industry, as the profitability of medicines will often stop from the day after the loss of exclusivity takes place. The patent that protects the pharmaceutical company of competition by generic manufacturers is valid for 20 years in developed countries. After development of the medicine, clinical trials, authorization processes and reimbursement requests, often there is only 8-10 years in the market, before the market gets flooded by generics which decrease the net margin with up to 90% (Lauks et al., 2025). If no new

candidate drugs are ready at that moment, the company will have issues paying their fixed costs.

#### *1.2.2.2 Mergers and acquisitions*

While organic growth is slow, and does not systemically change the organization, growth can be achieved much more quickly by inorganic growth via mergers and acquisitions (M&A). Büssgen and Stargardt have analysed 81 M&A by top 30 pharmaceutical companies to see which effects those M&A had on the growth of the pharmaceutical companies (Büssgen & Stargardt, 2024). The results can be summarized in different findings:

- 44.2% of the M&A transactions were financed through internal funding via cash flow; 55.8% through mixed funding.
- After a merger, on average, the annual revenue, market share, number of employees, launches, products in pipeline, gross and net profit, earnings before interests, taxes, depreciation and amortization (EBITDA), Return on Assets, and share prices increased.
- After a merger or acquisition, however, on average R&D spending and market capitalization decreased
- When compared with only organic growth though, effects can only be seen on the number of company's employees, gross profit, net profit and Return on Assets. No significant impact can be seen on market share, R&D spending, launches per year, products in the pipeline, EBITDA, share prices or market capitalization.

It seems therefore that M&A does not have a positive effect on innovation and shareholder value. This shows that it is important for pharmaceutical companies to carefully choose the possible candidates for a merger and acquisition as they don't have automatically a positive effect for the companies.

Some possible explanations for these findings might be that mergers limit the number of interdependent decision centers that are able or want to do the efforts that the small companies do in the expensive phases of clinical development and marketing. Furthermore, M&A can lead to more interference and issues to reconcile the internal R&D of the bought company by the buyer.

This paradox is consistent with what Higgins and Rodriguez wrote 20 years ago. Pharmaceutical companies increasingly use targeted acquisitions as a substitute for a

deterioration of their research pipelines and product sales, even when such acquisitions do not outperform organic growth on innovation (Higgins & Rodriguez, 2006).

#### *1.2.2.3 Strategic partnerships*

Besides M&A, there are different modes of cooperative agreements that can help develop the product portfolio of a company, from one-directional information flow until Joint ventures. The interdependence with the other company varies with the mode of cooperation (see figure 8).

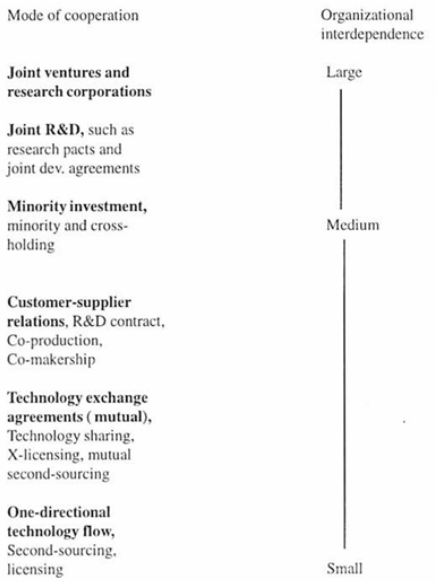


*Figure 8: different modes of cooperation (Duysters & Hagedoorn, 2000)*

- Joint ventures and research corporations are organizations that are created by two companies by joint ownership. The organization has a clear objective for research. The advantage is that the risk is spread between the two companies, fixed costs are shared and it's easier to access new markets
- Joint R&D: corporations pool resources to perform research. It is easier to terminate these agreements with a relatively small loss.
- Minority investments: In many industries, large companies are investing in small innovative companies to acquire access to new technologies. This is often a first step, to check how the technology is turning out, before doing a complete takeover.
- Customer-supplier relations in combination with licensing and R&D agreements: it could combine knowledge between the customer and the supplier, regulated by a closed contract.
- Technology exchange agreement and licensing agreement: companies are using specific patented technology in return for a payment.

#### *1.2.2.4 Dealmaking to increase R&D in the pharmaceutical industry*

A report was published in 2025 by McKinsey (McKinsey, 2025), which shows different conclusions:

- The M&A deals have decreased in the last years, while non-M&A deals have reached an all-time high, with licensing agreements accounting for a cumulative of $187 billion
- The partnerships are mainly for assets in late-stage (phase 3). This shows that companies use partnerships to derisk their pipeline, or are filling their late-stage pipeline gaps caused by Loss of Exclusivity of their drugs

An analysis on all M&A data by McKinsey shows that external innovation can be successful, measured by compounds moving from Phase 1 to launch, if:

- It concerns collaborative deals such as co-development or in-licensing instead of M&A.
- The deals concern products in early stages of development.
- Biological products were more successful.

AI and generative AI plays an important role in identifying the right partner with the right candidate drugs.

## 1.3. PROBLEM STATEMENT AND CORE MANAGEMENT DILEMMA

As described in chapter 1.1, the global pharmaceutical industry is facing structural issues. A global imminent patent cliff (lots of patents are going to expire between 2026 and 2030, including several blockbusters like Ozempic and Keytruda) exposes over $200 billion in yearly revenues due to generic and biosimilar competition (IQVIA, 2026). Legislative reforms in Europe and the US (as the Inflation Reduction Act or the possibly pending Most-Favourable Nation Law) to keep the budget under control are putting high strains on the profitability of the pharmaceutical companies. Eroom's law shows that internal R&D is undergoing a huge profitability crisis.

To offset this, more and more companies have shifted from organic growth by internal R&D strategies towards inorganic growth via M&A and partnerships. These strategic tools help to replenish the pipeline of the companies, and to have access to technological platforms to which they didn't have access yet, and de-risk their commercial portfolio. This reliance is creating a paradox though:

While M&A becomes imperative for the survival of companies, and to keep a healthy product portfolio, literature and empirical industry data shows that a significant part of

M&A does not generate long-term value to the shareholder, resulting in a decrease in R&D spending on the long term, and lower stock prices.

Consequently, pharmaceutical companies should consider the strategic basis for M&A, looking at their product portfolios, to optimize the product portfolio risk across specific therapeutic areas. They should also find the right balance between diversification to different therapeutic areas (to diversify their risk profile) or finding other medicines for the same therapeutic area, which would lower cost; the same sales teams can visit the same physicians with whom they have an existing relationship; the same medical teams with experience in this therapeutic area can enlarge the scope of their activities; …

This thesis investigates the following primary research question: How do pharmaceutical companies strategically structure and execute their external innovation strategy to optimize the risk profile of their product portfolios across specific therapeutic areas while sustaining long-term innovation and corporate value creation?

# 2.METHODOLOGY

## 2.1. RESEARCH PHILOSOPHY

The objective of this thesis is to check how pharmaceutical companies structure M&A and licensing deals to mitigate the risk profile of the product portfolio and pipeline across the core therapeutic areas. A deductive approach was followed, where the theory on building a portfolio on a risk-based way was tested against real life cases.

## 2.2. RESEARCH DESIGN

A qualitative case study was performed, where 5 licensing and M&A transactions of the post-covid period (2022-2026) were analyzed. This period was chosen to analyze the post-COVID capital reallocation, macroeconomic shifts and impact of the recent regulatory savings in pharmaceutical products (IRA and European reimbursement reluctance).

The product portfolio of the acquirer was compared to the product portfolio of the acquiree, to find trends in the product portfolio and the pipeline risk management strategies. This information was compared with sector insights from regulatory authorities, industry reports and public databases.

For this study, following M&A and licensing deals were analyzed:

- The Seagen M&A by Pfizer
- Iveric Bio being taken over by Astellas
- Karuna Therapeutics being taken over by Bristol Myers Squibb
- Carmot Therapeutics being bought by Roche
- Merck & Co. and Daiichi Sankyo co-development/licensing deal

A mix of top 30 pharmaceutical companies has been chosen, with a geographical spread between North America, Europe and Japan. Divestitures, spin-offs and generic/device deals were excluded.

## 2.3. DATA COLLECTION

Data was gathered from reliable financial news outlets covering the M&A, corporate disclosures, such as annual reports, investor deck presentations and press releases and regulatory and industry reports.

## 2.4. METHODOLOGICAL LIMITATIONS

Several methodological constraints should be acknowledged:

- Qualitative Scope: Due to the qualitative nature and limited sample size (5 case studies), findings can provide context-rich strategic insights rather than statistical generalizations across the entire global pharmaceutical industry.
- Information Asymmetry: The study relies only on publicly available data. Confidential financial terms, Contingent Value Rights (CVRs), undisclosed milestone structures in early-stage licensing, and internal R&D strategic information were unavailable for analysis. It should be noted that the author is employed by Astellas Pharma, one of the five acquirers analyzed in this study. The author held no role in, and had no access to, the Iveric Bio transaction, and this analysis relies exclusively on publicly available sources cited throughout this thesis. No internal or confidential information was used in the preparation of this case study.
- Time Lag: Evaluating long-term value creation and clinical trial outcomes resulting from recent transactions (2022–2026) falls outside the temporal scope of this study, as drug development cycles typically span 10–15 years.

# 3.RESULTS AND DISCUSSIONS

## 3.1. INDIVIDUAL DEAL PROFILES

### 3.1.1. Deal 1 : Pfizer/ Seagen

#### *3.1.1.1 Strategic Context and Portfolio Baseline before the Deal*

Pfizer Inc is a US company in the top 10 of the largest pharmaceutical companies. While Pfizer Inc made a revenue of $100.3B in 2022, this dropped to $58.5B in 2023 because of a drop of $43.9B in revenue attributable to COVID vaccines.

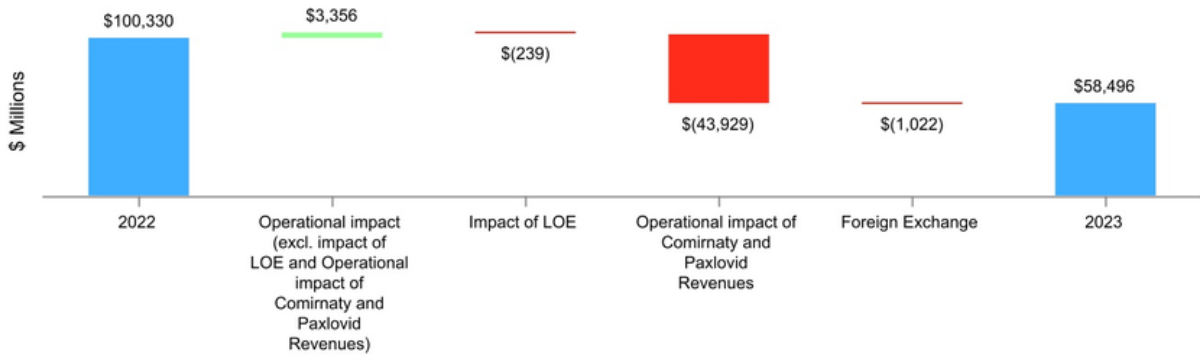


*Figure 9: Revenue in 2022 and 2023 (Pfizer, 2023b)*

An analysis of the 10K form of Pfizer submitted with the SEC (Pfizer, 2023b), shows that after the COVID sanitary crisis, where Pfizer had the rights of the most successful COVID vaccination together with BioNTech and an oral antiviral, Pfizer has a record amount of cash of $30B in liquid assets.

In the meantime, Pfizer faces a loss of exclusivity of several blockbuster assets like Eliquis ($6.7B yearly global revenue) in 2026, Prevnar 13 ($6.4B yearly global revenue) in 2026 and Ibrance ($4.7B yearly global revenue) in 2027, creating a huge strain on the possible growth of Pfizer in the coming years.

Product portfolio of Pfizer at the time of the merge was divided in Primary Care (including vaccines and other immunological medication - $30.5B revenue in 2023), Specialty care (with mainly antibiotics and autoimmune diseases - $14.9B revenue in 2023) and Oncology ($11.6B in 2023).

The pipeline of Pfizer contains a lot of different compounds, with a very high focus on Oncology drugs. In 2026, of the 31 compounds in phase 3, 20 were for oncology (https://www.pfizer.com/science/drug-product-pipeline; consulted on 27 Jul 2026).

Seagen (short for Seattle Genetics) was an American biotechnology company, focused on the development and commercialization of Antibody-drug conjugates, a technology to harness the ability of monoclonal antibodies to deliver natural cell-killing agents directly

to cancer cells. They had 4 products in the portfolio, Adcetris, Padcev, Tivdak and Tukysa, all 4 Antibody-drug conjugates and 30 drug candidates in development, all in the Oncology pipeline (Pfizer, 2023a).

#### *3.1.1.2 Deal Architecture and Governance*

The deal concerns an acquisition of all shares for $43B, the highest M&A since 2019 and a premium of 42% on the latest stock price before rumors of the deal came out. To finance the deal, Pfizer issued $31B of long-term debt to fund the deal without tapping into their cash reserves. The deal was accompanied by a reorganization of Pfizer's R&D department where it develops and commercializes its oncology drugs under a separate division, combining the legacy Pfizer oncology assets with Seagen. This reorganization was designed to preserve the R&D expertise from Seagen, retaining its core technology site in Bothell, Washington as an autonomous hub for Antibody-Drug Conjugate innovation (Pfizer, 2023b).

Unlike early-stage platform deals, the deal was an all-cash transaction without Contingent Value Rights (CVRs) or milestone-contingent payouts because of Seagen's mature commercial footprint and late-stage pipeline (Pfizer, 2023a).

#### *3.1.1.3 Impact on Portfolio Risk Profile*

The oncology portfolio of Pfizer was predominantly heavy small molecules. The deal has added a new technological platform with the biologics/Antibody-Drug Conjugates. Before the deal, biologics accounted for less than 10% of Pfizer's oncology revenue, but after the deal, this is projected to increase to 65% by 2030. Therefore, Pfizer has now a better mix of chemical drugs and biologics, in their oncology portfolio. Furthermore, they doubled their oncology pipeline overnight with this deal.

With this deal, Pfizer has decided to de-risk the pipeline, acquiring a mature company with commercial and Phase 3 programs. The deal is generating immediately cash flow, as the commercial drugs already made around $3B yearly (Pfizer, 2023b).

#### *3.1.1.4 Strategic Rationale and Expected Value Drivers*

The choice of this partner is guided by the fact that Pfizer had a high cash position due to the COVID-19 vaccination. Pfizer also needed to offset its Loss of Exclusivity of several of its blockbusters, accounting for a loss of $17-20B in sales by 2030. The deal with Seagen is projected to generate $10B in risk-adjusted annual revenue by 2030.

Seagen's shareholders received a substantial acquisition price, and they have access to the global regulatory and commercialization footprint, enabling faster market expansion across Europe, Asia and emerging markets.

The deal required approval from the US Federal Trade Commission and the European Commission for antitrust legislation. The deal was only approved after Pfizer decided to donate royalties from its existing ADC asset.

Besides the main goal of the deal (acquiring the four commercialized drugs and the 30 drugs in the pipeline), the deal's

rationale was also to get access to a new technological platform of Antibody-Drug conjugates. In the original deal, Pfizer mentions that within 3 years, they'll expect cost synergies close to $1B (Elfman, 2023). In 2025, they announced indeed that 100 jobs would be cut at the previous Seagen site, while they already targeted savings of $500M in 2024, and $3.2B by 2027, including numerous layoffs (Manalac, 2025).


*Figure 10: Pfizer Inc stock price (Yahoo finance)*

While the deal gave access to new technologies, and lots of new drugs and candidate drugs in late stage, activist shareholders criticized Pfizer for overpaying for Seagen. The Pfizer stock price has taken a huge dip since the end of COVID-19 and after the subsequent criticisms regarding the premium paid for the deal with Seagen.

### 3.1.2. Deal 2 : Astellas / Iveric Bio

#### *3.1.2.1 Strategic Context and Pre-Deal Portfolio Baseline*

Astellas Pharma Inc. is a Japanese pharmaceutical company, listed on the Tokyo Stock Exchange with a capitalization of ¥2.15T (€11.7B). In Fiscal Year (FY) 2024 (March 2024-March 2025), it made a revenue of ¥1.912T (€11.7B) which is an increase of 19% compared to FY2023. Before the deal, Astellas was divided in 2 departments: oncology and specialty (more specifically in urology, immunology and women's health). For the oncology department, Xtandi is the main product with a revenue of ¥912.3B (€5.6B) or

47% of the total revenue. This is a big risk, as Xtandi faces LOE in 2027 (US and Europe) and 2028 (Japan) (Astellas Pharma, 2025).

To offset the Xtandi LOE, the strategic brands, the brands in the beginning of their lifecycle that do not have a LOE pending like Padcev, Vyloy and Xospata (oncology) and Veozah (women's health) are expected to expand significantly. Meanwhile, the company is trying to decrease the costs for the Selling, general and administrative expenses to try to increase the operating profit.

These strategies are not enough though, to offset the loss of Xtandi profits in 2027. The drug candidates in the pipeline in 2024 were in phase 1 or 2, so still around 5-8 years from commercialization, with a small chance of success.

At the time of acquisition, Iveric Bio was a Nasdaq listed biopharmaceutical company with one drug (Izervay), having completed successful Phase 3 clinical trials and a New Drug Application being granted by the US food and drug administration. They also had a couple of drug candidates in the pipeline. All drugs are in the ophthalmology domain, with the most advanced drug in a program for Geographic Atrophy secondary to age-related macular degeneration, a progressive eye disease leading to irreversible vision loss, affecting over 1.5 million people in the US (Astellas Pharma, 2023).

#### *3.1.2.2 Deal Architecture and Governance*

In April 2023, Astellas Pharma and Iveric Bio entered into an agreement under which Astellas acquired 100% of the outstanding shares of Iveric Bio for $40.00 per share, for a total equity value of $5.9B, or a premium of 64% to the latest Iveric Bio's share price before announcing the acquisition (Astellas Pharma, 2023).

Astellas used a combination of cash reserves, short-term bank loans and commercial paper to fund the acquisition. This allowed the company to keep long-term balance-sheet flexibility without issuing new equity. The deal was all-cash without CVR or milestone based earnouts, since Iveric Bio is a mature partner with a lead asset that already cleared Phase III trials (Iveric bio, 2023).

Iveric Bio was integrated as a subsidiary, and was established by Astellas as the operational foundation of an ophthalmology unit with primary focus on Blindness and Regeneration. Astellas also bought the know-how of the experts in ophthalmology field, as well as a multi-faceted commercial team with established relationships with medical institutions (Astellas Pharma, 2023).

#### *3.1.2.3 Impact on Portfolio Risk Profile*

Astellas revenue profile was heavily skewed towards prostate cancer therapies, due to one mega-blockbluster, Xtandi, being responsible for more than 45% of its revenue. This leaves its product portfolio highly exposed to one patent loss. With the acquisition of Iveric Bio, and Izervay, Astellas introduces a new biopharmaceutical technology platform to its R&D strategy, and is now also active in a novel therapeutical area.

Astellas decided to acquire an asset that was at the final stages of approval in the US. In August 2023, FDA approval was effectively granted. With this deal, they wanted to de-risk their strategy. Instead of buying a high-risk company with Phase 1 and 2 exploratory cinical trials, Astellas paid a premium to acquire a de-risked phase 3 asset to secure cash flows in the near future (Astellas Pharma, 2023).

#### *3.1.2.4 Strategic Rationale and Expected Value Drivers*

For Astellas, the primary strategy behind the deal was to replace the revenue to offset the impact of Xtandi's LOE. Izervay is targeting a peak sales of ¥200B to ¥400B ($1.3B to $2.6B) globally, directly offsetting a major impact of the LOE of Xtandi. The deal also allowed Astellas to be in a high-demand Geographic Atrophy market, with only one direct competitor. The deal gave Astellas access to the R&D capabilities of Iveric bio(Dunleavy, 2025).

For Iveric bio, the deal was positive, since they were able to receive a 64% premium on the latest stock price. While they created a successful biopharmaceutical company with a successful medicine completing successful Phase 3 trials, they profited from the merger by gaining access to an international commercial infrastructure and to Astellas' global commercial organization, regulatory expertise and distribution network , outside the US, allowing international market access of Izervay and future candidate drugs.

While the deal was with two complementary companies, there were also some worries from for example the Japanese Credit Rating Agency. In 2024, they changed the outlook for Astellas from Stable to Negative, while maintaining the AA+ rating. The rationale for changing the outlook of Astellas is that the financial structure deteriorated after acquiring Iveric Bio, lowering the operating profit due to the amortization of the intangible assets. The interest-bearing debt increased with this deal. While in FY2022, 61.4% of equity was owned by the parent company, this decreased to 44.7% at the end of FY2023. If Izervay cannot achieve the revenue target, impairment risk can be expected (Japanese credit rating agency, 2024).

Astellas announced in 2024 that they withdrew its European Medicines Agency (EMA) application for Izervay, because the EMA was indicating that the drug's effect in slowing lesion growth did not show a clinical meaningful benefit to the patient visual function. This means that the drug cannot profit from the European Union market. However, Astellas announced in 2024 that they'll be able to get the goal $1.3B to $2.6B annual peak sales just in the US (Dunleavy, 2025).

While the LOE is threatening 45% of the revenue, the strategy of Astellas, to focus on certain strategic brands, including Izervay, and by saving costs on the SG&A departments, increasing the gross profit is being positively welcomed by the investors. While the Pharmaceutical industry is generally decreasing, Astellas was able to maintain stable and even lightly increase its stock price, while offering annual dividend of 3.6% of its stock price, and increasing.


*Figure 11: Astellas Pharma stock price for the last 5 years (Yahoo Finance)*

### 3.1.3. Deal 3 : Bristol Myers Squibb / Karuna Therapeutics

#### *3.1.3.1 Strategic Context and Pre-Deal Portfolio Baseline*

Bristol Myers Squibb (BMS) is an American multinational pharmaceutical company, headquartered in Princeton, New Jersey. In 2023, BMS made a revenue of $45B, which makes it a top 10 pharmaceutical company. The revenue in 2023 was 2% lower than the revenue in 2022, because of LOE of Revlimid, an oncological immunomodulating drug against multiple myeloma. LOE made the product (worth a little less than $10B per year) lose almost 40% of its revenue (Bristol Myers Squibb, 2023), because of price decreases due to generic competition.

The portfolio of BMS can be described as quite diverse. They are active in a lot of indications in the therapeutical domains of oncology, hematology, immunology and cardiovascular. They were also active in the development of neuroscience drugs with one product in Phase 1 (Bristol Myers Squibb, 2023). BMS wanting to add neuroscience drugs to the pipeline, looked at partners to rapidly expand these therapeutic areas.

Karuna Therapeutics, founded in 2009 was a clinical-stage biopharmaceutical company focused on neuropsychiatric disorders. It had a medication KarXT, an antipsychotic for treatment of schizophrenia in adults. It is a first new mechanism of action for schizophrenia in decades, as it is not working on the dopamine receptors, but on the M1/M4 muscarinic receptors. At the time of merger, KarXT was awaiting a verdict from the FDA, and later on, in September 2024, it was approved. The medication was also tested in the bigger markets of psychosis in patients with Alzheimer's disease and in bipolar disorder (Taylor, 2023).

#### *3.1.3.2 Deal Architecture and Governance*

The deal was announced on December 22, 2023, where BMS announced the merger agreement to acquire Karuna. This deal was rapidly closed on 18 March 2024.

BMS paid $14.0B for Karuna, which translates to $330 per share, or a 53% premium over Karuna's closing price before announcement of the deal. BMS paid for the deal in cash, and did not issue equity or offer CVRs. The cash came from long-term debt.

The deal was part of different other acquisitions that BMS closed in the same period (Mirati for $4.8B, RayzeBio for $4.1B and a licensing agreement with SystImmune). These deals, made the total debt at $39.8B (Bristol Myers Squibb, 2023, 2024; Taylor, 2023).

With the deal with Karuna, BMS created a specialized Neuroscience Business Unit. This preserved Karuna's neuroscience research capabilities. This business unit was later on integrated into BMS's specialty care organization (Bristol Myers Squibb, 2024).

#### *3.1.3.3 Impact on Portfolio Risk Profile*

Instead of buying an early stage biopharmaceutical company with only candidate drugs in Phase 1 and 2, BMS decided to buy Karuna, a mature partner with one candidate drug having successfully finished Phase 3 trials. The acquisition diminishes the risk profile of the BMS portfolio, from early-stage clinical uncertainty towards late-stage regulatory and commercial risk.

Before the deal, BMS was active in neuroscience but for a very small proportion of their activities. They were mainly focused on oncology, immunology and hematology. Adding

a new platform of neuroscience drug, with a newly developed muscarinic platform, they diversified their product portfolio. While the market of antipsychotics is filled with very cheap generic drugs, working well for the majority of the patients, the success will depend on the ability to convince the prescribers that the new pathway is more efficacious or safe, and to convince the private health insurance companies and the ministries of social affairs that it is worth it to reimburse this new (much more expensive) drug.

#### *3.1.3.4 Strategic Rationale and Expected Value Drivers*

For BMS, there were several reasons for buying Karuna. Firstly, they started in the neuroscience, with one Phase 1 drug candidate. By this deal, BMS got access to Karuna's R&D capabilities and scientists who were able to successfully develop a drug in this domain. Furthermore, KarXT (later on rebranded to Cobenfy) had a first-in-class mechanism, for a disease with a population of 1.6 million treated schizophrenia patients in the US, and multiple opportunities to expand the indication to Psychosis in Alzheimer's disease and bipolar disorder. The forecast at the time of merger were of $8B per year sales for the drug. The deal was also part of different mergers in BMS, with the goal of filling their product portfolio after the facing LOEs of a majority of their drug portfolio (Bristol Myers Squibb, 2024; Taylor, 2023).

For Karuna, the deal was positive in the sense that (even before having a response from the FDA, and before knowing if the sales would be successful) they were able to sell their actions for a 53% premium, and having access to the global footprint of BMS, including their global regulatory and sales departments.

Despite the strategy behind the deal, until now, the deal was not successful. While BMS succeeded in getting reimbursement deals with private insurance companies in the US, they are having difficulties to get prescribers to prescribe the drug instead of cheap generic antipsychotics. The price of Cobenfy is around $20K per year per patient instead of $540 per year for one of the more expensive generic antipsychotics with a classical pathway. In the first months after launch, they did $10M sales in Q4 2024 (partial quarter), $27M in Q1 2025, $35M in Q2 2025 and $43M in Q3 2025, with a full year sales of around $155M for 2025. Although they are growing steadily, these sales are far from the $8B peak sales that were forecasted. Reaching this will be dependent on successful Phase 3 studies on indication expansion for Alzheimer's disease psychosis indication and successful Phase 2 studies on an indication expansion to Bipolar disorder (Bell, 2025).


*Figure 12: BMS stock price for the last 5 years (Yahoo Finance)*

While the stock price has increased since the merger with Karuna, it is hard to isolate the merger from this graph. The stock price has recently spiked due to merger rumors with AstraZeneca. While analysts are not happy with the premium paid for Karuna, and the recent results of the Cobenfy drug, their strategy in total is succeeding in keeping the company stable (with minimal negative growth), amidst the expected LOE for 40% of their product portfolio. While this deal in particular is not (yet) providing much value, other deals (with also late-stage assets) are.

### 3.1.4. Deal 4: Roche/ Carmot Therapeutics

#### *3.1.4.1 Strategic Context and Pre-Deal Portfolio Baseline*

Roche is a Swiss company divided into a diagnostic and a pharmaceutical division. The diagnostic division made 14.353B CHF (€15.463B) revenue in 2024 (pre-deal), and is focused on selling diagnostic and monitoring tests for cardiometabolic diseases, diabetes, infectious diseases, neurology, oncology, rare diseases and women's health. This division is completely separated from its pharmaceutical division that, in 2024 was making 48.042B CHF (€51.109B) from its assets in oncology (15.835B CHF (€16.846B)), hematology (7.909B CHF (€8.414B)), neurology (9.267B CHF (€9.859B)), immunology (6.329B CHF (€6.733B)), ophthalmology (4.030B CHF (€4.287B)) and other therapeutic areas (2.801B CHF (€2.980B). The revenue in 2024 was slightly higher than in 2023 when it was at 45.913B CHF (4.6% increase). It's revenue made Roche being in the top 10 of the worldwide pharmaceutical companies (Roche, 2025).

Because the diagnostics and the pharmaceuticals are partly in the same domain, there are strong synergies, where Roche can for example provide diagnostic tests so that the specific cancer can be treated with Roche's drugs.

While Roche also had a patent cliff of several of their blockbusters (Actemra in 2023, Avastin, Herceptin and MabThera since 2017), they succeeded to keep their growth due to new assets in ophthalmology and multiple sclerosis.

The biggest risk for Roche was not an expected LOE of one of their blockbusters, like it is the case for Pfizer, Astellas and BMS, but rather the fear of missing out on a part of the pie of the huge blockbusters of the GLP-1/GIP agonists for obesity and diabetes, with which Eli Lilly (Mounjaro and Zepbound) and Novo Nordisk (Ozempic and Wegovy) have become some of the biggest companies in the pharmaceutical industry (Waldron, 2024).

Carmot Therapeutics was a privately held, clinical-stage biotechnology company, based in California, US. The focus of the company is GLP-1/GIP agonists for use in obesity, as direct competitors of Eli Lilly and Novo Nordisk. Carmot had 3 drug candidates in early clinical development (Roche, 2026a; Waldron, 2024).

- CT-388: weekly subcutaneous GLP-1/GIP agonist for obesity ready for Phase 2
- CT-996: a once daily oral GLP-1 agonist for obesity in Phase 1
- CT-868: a once daily subcutaneous dual GLP-1/GIP agonist for type 1 diabetes in overweight and obese patients in Phase 2.

#### *3.1.4.2 Deal Architecture and Governance*

In December 2023, Roche announced a definitive merger agreement to acquire Carmot Therapeutics for $2.7B in cash and up to $400M in milestone payments. Because Carmot was privately owned, rather than publicly traded, the transaction didn't involve offering a market premium calculation, but the valuation was negotiated directly with Carmot's shareholders. The fact that a milestone payment has been negotiated, is linked to the fact that Carmot is early clinical stage, and therefore has a higher risk that the assets will fail. This contrasts with the other case studies where no milestone-based structures were included.

The Carmot team has been included in Roche's Pharmaceutical Division to work on Carmot's pipeline, alongside Roche's existing cardiometabolic assets (Waldron, 2024).

#### *3.1.4.3 Impact on Portfolio Risk Profile*

Unlike the three preceding case studies, Roche didn't use this deal to replace some of the LOE drugs in its drug portfolio, but rather to fill their pipeline with a new very successful

platform. Since they are not yet active in obesity and metabolic disease, with this deal, they are diversifying in a new therapeutic category for obesity and metabolic diseases, but highly complementary with another drug in Roche's pipeline (RO7204239) for Spinal Muscular Atrophy (a genetic muscular disease in children), which could also help offset muscular loss which is a common adverse event with GLP-1/GIP agonists (Waldron, 2024).

Roche accepted in this deal higher clinical risks, with Phase 1 and 2 assets that were far from approval, in exchange for a much lower acquisition cost compared to the other deals described.

#### *3.1.4.4 Strategic Rationale and Expected Value Drivers*

For Roche, the strategic rationale was to fill their pipeline within the GLP-1/GIP platform for obesity, with a drug that showed success within Phase 1, gaining a couple of years in the race to the next big drug within this platform. While the cost of this deal is much lower than the cost for the other deals described, it is a high price for a company that is very far from market entry. This cost can be explained by the therapeutical domain in which they are active. Obesity is a problem affecting more than 500 million people worldwide, with a high part in developed countries. The first anti-obesity GLP-1/GIP agonists were worldwide successes, and the global market is projected to grow to $185.32B by 2033, compared to the global medicine market which is valued at approximately $2T (Grand View Research, 2026). While the deal represent diversification into a therapeutic domain where Roche was not yet active, there are synergies between the obesity drug and other drugs from Roche's pipeline. Furthermore, besides gaining access to these candidate drugs, Roche has gained access to the discovery platform of Carmot, being capable of generating future obesity drugs. This platform is particularly relevant given the industry is going towards AI for drug discovery as described in 1.1.2.2. In 2023, Carmot spun off a dedicated entity (Kimia Therapeutics) to combine the obesity platform with machine learning for drug discovery. By acquiring Carmot, Roche secured access to the machine-learning engine and to opportunities in the future for more quick drug discovery (Carmot Therapeutics, 2023).

For Carmot, the deal was very positive, as they were able to cash out from their portfolio without having to take the risks that the candidate drugs would fail in Phase 2 and 3, and without the risk that by the time the drugs come into the market, it is no longer commercially viable because there might be new, safer, drugs available for this disease, as the pharmaceutical industry is hyper-investing in this therapeutical domain.

At the time of writing, the candidate drug CT-996 had successful Phase 1, with 7.3% weight loss after four weeks of treatment. The CT-388 candidate drug has successfully shown efficacy and safety in Phase 2, making it ready to move on to Phase 3 studies (Roche, 2026b).


*Figure 13: Roche Holding stock price (Yahoo finance)*

The stock price of Roche has increased quite a lot since the deal has been struck. The deal is however quite insignificant in the overall revenue of Roche, so it is difficult to assign part of it to the deal. Analysts however were quite optimistic about the strategy behind the deal (Ghigini, 2024), even with the high price that has been paid for Carmot.

### 3.1.5. Deal 5: Merck & Co./Daiichi Sankyo

#### *3.1.5.1 Strategic Context and Deal Architecture*

By the end of 2023, Merck & Co faced an expected patent-cliff due to the LOE of Keytruda in 2028 in the US. In 2023, Keytruda made $25.011B in revenue. This made (and still makes) it the most valuable medication, used for different kinds of cancer as immune-therapy. This medication is a gold mine for Merck & Co, but they are also highly dependent on this drug, as it represented in 2023 42% of its worldwide revenue, and the drug was on the list of those medications for which negotiations would start with Medicare due to the IRA (see 1.1.4.3) (Merck & Co, 2023).

While Keytruda is a huge success, Merck wanted to prepare for the next wave of oncological drugs, and went for a new platform of ADCs, which have shown a commercial success. Merck's earlier attempt to acquire Seagen was ultimately unsuccessful, with the company acquired by Pfizer instead (see 3.1.1) (Vinluan, 2023).

Instead of searching a new partner to acquire, Merck went for a licensing agreement with Daiichi Sankyo, including three different drug ADC candidates: Patritumab deruxtecan (HER3-DXd for Non-Small Cell Lung Cancer) (post phase 3), ifinatamab deruxtecan (I-DXd for Small Cell Lung Cancer) (phase 2), and raludotatug deruxtecan (R-DXd) (phase 1 for Ovarian Cancer). The deal included co-development and co-commercialisation of the drug with Daiichi Sankyo, where Daiichi Sankyo would retain the responsibility for manufacturing and supply and the commercial rights in Japan (the country of its headquarters). The companies would co-develop and co-commercialize elsewhere worldwide with the costs and profits split 50/50 (Brooks, 2023; Dokomjilar, 2023; Merck Co, 2023).

The deal is structured in an upfront payment of $4B upfront in addition to $1.5B in continuation payments over the next 24 months, and additional payments of up to $16.5B upon the achievement of future sales milestones for a total potential consideration of up to $22B (Daiichi Sankyo, 2023). Merck assumed responsibility for 75% of the first $2B in R&D costs for raludotatug deruxtecan, and retained a unilateral right to withdraw from two of the three programs (those in Phase 1 and 2).

#### *3.1.5.2 Impact on Portfolio Risk Profile and strategic rationale*

This deal is, contradictory to the other deals that are described, not an outright acquisition, but rather a non-equity licensing co-development deal. Merck secured access to a multi-asset ADC pipeline, de-risking and diversifying its product portfolio while keeping the risk low, because of milestone payments and the option to abandon two of the three programs. The risk for the clinical success of the programs is therefore divided between Daiichi Sankyo and Merck, but the upside as well.

Strategically, the collaboration served following purposes:

- It gave Merck access to the ADC platform, a highly rising platform which created several blockbusters in the past. Since it is working on a different pathway, it could be used in combination therapy with Keytruda (immunotherapy), selling two drugs instead of zero for those patients that would not react to Keytruda in monotherapy.
- A licensing deal avoids the risks related to integration, while still allowing rapid entry into this new platform.

The disadvantage is that the drug is co-licensed, so that only half of the earnings would be for Merck. Furthermore, the deal does not disallow Daiichi Sankyo to use their R&D knowledge to further develop ADC's that could compete with the ones co-licensed with Merck, as the co-development is limited to those 3 programs.

The co-licensing agreement was extended to a 4$^{th}$ drug in 2024. However, in 2025, Merck and Daiichi pulled temporarily the plug on the patritumab deruxtecan (the drug candidate that was the farthest in the process) authorization, as the FDA had manufacturing concerns related to a third-party manufacturing facility, and later on, a overall survival study didn't meet statistical significance. This shows a risk of the co-licensing agreement, where the manufacturing was still completely managed by Daiichi, leading to a delay in market access (Masson, 2025).

## 3.2. CROSS-CASE ANALYSIS AND DISCUSSION

### 3.2.1. Comparative overview of the five cases

| | Deal 1: Pfizer / Seagen | Deal 2: Astellas / Iveric Bio | Deal 3: BMS / Karuna | Deal 4: Roche / Carmot | Deal 5: Merck / Daiichi Sankyo |
|---|---|---|---|---|---|
| Deal type | Acquisition[1] | Acquisition[1] | Acquisition[1] | Acquisition[1] | Co-licensing |
| Price | $43B | $5.9B | $14.0B | $2.7B cash Up to $400M in milestone payments | Up to $22B |
| Premium paid | 42%[2] | 64%[2] | 53%[2] | N/A[3] | N/A (licensing deal) |
| Main asset stage at signing | 4 assets on the market | Phase 3 completed | Phase 3 completed | Early clinical stage (Phase 2 -ready) | Mixed stage: lead asset near-registration |
| Consideration structure | 100% cash, no CRV / milestone payments | 100% cash, no CRV / milestone payments | 100% cash, no CRV / milestone payments | Cash + Milestone payment | Cash upfront ($4B) + up to $16.5B in milestones for future sales |
| Therapeutic rationale | New platform in existing therapeutical area | Diversifying in a new therapeutical area | New platform in a therapeutical area that was recently started up | Diversifying in a new therapeutical area with possible synergies | New platform in existing therapeutical area with possible synergies |
| Strategic rationale | Offsetting blockbusters facing LOE / end of COVID-19 vaccination program | Offsetting blockbuster facing LOE | Offsetting different blockbusters facing LOE | Risk of missing out on highly successful GLP-1/GIP agonists | Offsetting blockbuster facing LOE |

Table 1: Comparative overview of the different case studies

[1]: Even though the deals were structured and announced as mergers in the legal sense, in practice, it concerns acquisitions in the sense that the company that was taken over was completely absorbed in the acquiring company.

[2]: Premium paid was calculated based on the latest price pre-rumors

[3]: Carmot was privately held, so the price was negotiated between Roche and Carmot

### 3.2.2. Deal Structure along the governance continuum: M&A vs. Licensing

As described in 1.2.2.3, there are different modes of cooperation. In this case study, 2 different modes of cooperation were discussed. Deal 1-4 concerns full acquisitions, where there is a complete interdependency of the two companies, and the acquirer has completely taken over the acquiree, including the R&D department. Deal 5 concerns a

co-licensing deal, with smaller organizational interdependence. The company which got paid for the licensing deal can still keep its R&D department and develop other drugs that can completely compete with the drugs included in the co-licensing agreement (Duysters & Hagedoorn, 2000).

As described in 1.2.2.4, McKinsey came to the conclusion that partnerships are mainly used to de-risk their pipeline and to fill the pipeline gaps caused by LOE. While in deal 5 with Merck and Daiichi, there is certainly a derisking of Merck's pipeline, in a way that doesn't add too much risk, because of the deferred milestone-payments, it was not the first option of Merck to go for a partnership for ADC compounds, as evidenced by Merck's earlier unsuccessful bid on Seagen which was ultimately acquired by Pfizer. McKinsey also found out that partnerships such as co-development and co-licensing were more successful than M&A, and especially deals in early stages of development were successful (McKinsey, 2025). In our sample, we notice that a lot of products succeeded to go to next stage of clinical development/commercialization. Izervay from deal 2 went to commercialization in the US, Cobenfy from deal 3 realized commercialization in the US. In deal 4, CT-996 and CT-388 successfully finalized respectively phase 1 and phase 2. Those successes came from M&As. There were also some fails in clinical development/commercialization: Izervay (deal 2) didn't succeed to get commercialization in Europe, Cobenfy (deal 3) did succeed to get commercialization, but their initial goal of $8B per year had to be revised down to $2B per year. In the partnership deal (patritumab deruxtecan (deal 5)), there were issues with the FDA approval. It is a set-back, but the other molecules in the deal are still progressing.

Since it is a small size sample, it is not possible to confirm or reject the findings of McKinsey that the non-M&A collaborative deals are more successful than the M&A deals, but in our sample, the non-M&A deal was not more successful than the different M&A deals. This distinction is also apparent in the Open Innovation framework as described in section 1.2.1 (Chesbrough, 2003). While the transactions represented a shift away from purely internal R&D towards externally sourced innovation, in the four M&A deals (Deals 1-4) the external innovation was temporary, and after a while, the acquired firm ceased to exist, while their innovation centers were absorbed into the acquirer's innovation framework. Only in Deal 5, the collaboration was for a long term, and the innovation was really opened sustainably by the partnership between Merck and Daiichi Sankyo.

### 3.2.3. Asset stage and de-risking logic

In the sample size, there are three late-stage acquisitions. Pfizer has taken over Seagen, which was already active on the commercial market. Astellas took over Iveric, with one compound ready for commercialization and BMS took over Karuna with one compound also ready for commercialization. Those deals (deal 1-3) were done in 100% cash, without CVR or milestone payments. The risk is not clinical (the compound doesn't do what it needs to do in real life patient populations), but rather commercial. These deals are confirming the findings of Higgins and Rodriguez that M&A of late-stage compounds can eliminate the clinical risk, and are used to de-risk their portfolio (Higgins & Rodriguez, 2006). It is not coincidental that those deals happen with 3 companies with pending LOE. The commercial risk can be observed in deal 2, where Astellas received a degradation of its Japanese credit rating, and in deal 3, where Cobenfy sales were not performing according to forecasts before the deal. There is also the financial risk, where those companies paid a premium of 42-64% for the acquirees.

In deal 4, Roche did accept a real clinical risk, buying a company with early clinical assets. This is a good example of an intermediary situation, where Roche accepts the risk of buying a company with assets in Phase 1 and 2, but chooses a full acquisition instead of a licensing deal. While there were some deferred payments in the deal, there is no option to get out of it, like would be the case for an in-licensing deal. In this deal, Roche did not perform the acquisition with the goal to de-risk its portfolio, but rather to not miss out on the booming obesity GLP-1/GIP market. Roche didn't want to wait for the Phase 2 data before acting, or risking to go for a licensing deal with an immature partner, because the competition was already set with Novo Nordisk and Eli Lilly.

Deal 5 is the example where there is a mixed clinical risk with one advanced candidate drug and 2 clinical stage candidate drugs. Contrary to deal 4, Merck structured it in a co-licensing deal, with 82% of the deal in milestone payments and the right to withdraw from 2 of the 3 programs. This is consistent with the findings of McKinsey (McKinsey, 2025) that non-M&A deals work best for early-stage assets.

The sample confirms that late-stage and commercial assets are typically acquired with upfront cash (Deals 1-3) with the goal to de-risk the pipeline/product portfolio. The comparison of Deals 4 and 5 shows that although the clinical risk is comparable, Roche went for a full acquisition where Merck went for a licensing deal, shifting a big part of the clinical and commercial risk on the licensor. Roche didn't want to miss out on the obesity GLP-1/GIP market, so went for a quick M&A, which allows them to fund these

programs intensely without needing to coordinate investment decisions with their partner. For Merck, the goal was to de-risk their pipeline, and offset LOE of their products, while keeping some synergies with their existing drugs. Merck initially wanted to buy its way into the ADC market, as evidenced by its earlier attempt to acquire Seagen, a co-licensing deal with a mature partner (Daiichi Sankyo has around 120 years of expertise) proved a good alternative. This shows that governance structure and asset-stage risk are two independent strategic choices, and depend also highly on the strategic objective behind the deal.

The asset-stage risk is also observed by how each transaction was paid for. The late-stage acquisitions (Pfizer, Astellas and BMS) were all paid for in 100% cash at closing, with no contingent or milestone-based component. The buyers were confident in the clinical success, so were willing to accept the risk of paying in full upfront. In the other two deals (Roche and Merck), there was residual clinical risk, so they negotiated milestone payments, which allow the acquirers to pay less if the clinical trials show that the candidate drugs are unsuccessful. We can conclude that the financial structure of the deal is not an independent strategic lever, but is directly dependent on the asset-stage risk.

### 3.2.4. Therapeutic Area Strategy : Development vs diversification

In the deals that were described, there were two deals that had the goal to deepen its position in a therapeutic area in which they were already active, and three where a diversification to a new therapeutic area was pursued. The distinction is explained in the introduction in 2.2.1 in the typology by Ansoff on product-market strategy (Ansoff, 1957). Acquiring a new technological platform for an existing therapeutical domain corresponds to the product development strategy, while entering a new therapeutic area, in which the acquirer has no or little experience, corresponds to diversification. According to Ansoff, diversification is the highest strategic risk, since it requires additional capabilities, and building new market knowledge.

Pfizer/Seagen (deal 1) and Merck/Daiichi Sankyo (deal 5) are the two cases from our case studies that correspond to product development strategy. While Pfizer already marketed several small-molecule oncological medications, and Merck marketed the mega-blockbuster Keytruda, an immune therapy for treating cancer, they both went for a deal with a company active in ADC-technology in the same therapeutic area. Besides simply replenishing their pipeline, the deal allowed synergies and cost-saving afterwards, because Pfizer and Merck already had the oncological R&D centers, the regulatory

relationships and the commercial infrastructure that were already in place for this therapeutic area. At Pfizer, this was seen, since a couple of years after the deal, large savings in the legacy Seagen R&D centers were undertaken. For Merck, the product development strategy also allowed them possibilities to market the ADC-technology in co-therapy with its existing immunotherapy drugs.

Astellas/Iveric Bio (deal 2), BMS/Karuna (deal 3) and Roche/Carmot (deal 4) had the goal of pursuing diversification. Astellas had no prior presence in ophthalmology before acquiring Iveric Bio. BMS had one neuroscience candidate drug in Phase 1 before acquiring Karuna, so they used the deal to accelerate their expansion into this new therapeutic area. Roche had no obesity drugs prior to the deal with Carmot. While Ansoff described those deals as high-risk growth path, because new market knowledge, new R&D capabilities and new commercial infrastructure need to be built, this can be observed in these deals. At Astellas, the credit outlook was downgraded because of execution concerns tied to a new therapeutic category. The credit rating bureau was partially right, as Astellas failed to market the product in Europe, but also partially wrong, given that Astellas reached the sales as analyzed beforehand worldwide, solely in the US, and they were able to decrease their SG&A costs in the years following the acquisition. The diversification risk was also observed in BMS, where they struggled to get the prescriber adoption in a difficult market, with numerous generic competitors. Their commercial organization had difficulties navigating this. For Roche, the assessment cannot yet be made, because the products are too early in the clinical development. The difference between Roche and Astellas / BMS though, is that Roche diversified to this new therapeutic domain with a specific goal to break open this highly profitable market, and is willing to invest heavily to become one of the key obesity/GLP-1/GIP players, while Astellas/BMS diversified to de-risk their pipeline, while they still needed extra savings to offset LOEs.

In this observation, we can notice that the product development/diversification distinction does not align with the M&A versus licensing distinction, nor the asset-stage distinction. This shows that the difference in governance, the asset-stage and the therapeutic-area strategy are three different strategic levers, which can be made semi-independently.

### 3.2.5. Synthesis : Answering the Research Question

Considering sections 3.2.2, 3.2.3 and 3.2.4, we can answer the research question: “How do pharmaceutical companies structure M&A and licensing deals to mitigate the risk profile of the product portfolio and pipeline across the core therapeutic areas”.

Instead of one clear cut strategy, there are three largely independent strategic levers.

- The governance structure along the spectrum of Duysters and Hagedoorn (Duysters & Hagedoorn, 2000), ranging from full M&A transactions up to licensing and co-development determines the financial risk and reward, where M&A deals take the full risk, but also the full reward. In the licensing deal however, another risk, could be observed, where Daiichi Sankyo retained oversight of the outsourced manufacturing facility, leading to FDA concerns and delayed market access. This risk might not have existed if this activity would be under the full responsibility of Merck. McKinsey (McKinsey, 2025) found that non-M&A partnerships generally outperform M&A partnerships, but this has not been fully observed in our sample. In the full acquisitions, Izervay and Cobenfy reached US commercialization, and CT-388 and CT-996 completed successfully Phase 2 and Phase 1. The one licensing deal in the sample encountered a significant setback. Due to the small sample size, this sample cannot confirm or reject McKinsey’s finding with statistical confidence, though it suggests that M&A can, in some cases, be the more suitable option.
- The second lever is linked to the asset-stage risk. Deals 1-3 targeted late-stage assets, paid entirely in cash, without milestone payments, consistent with Higgins and Rodriguez (Higgins & Rodriguez, 2006) finding that acquiring late-stage compounds eliminates clinical risk and de-risks the acquirer’s portfolio. It is not coincidental that those late-stage deals happen with three companies facing pending significant LOE. The clinical de-risking did not eliminate the commercial risk though, shown by Astellas’ credit rating downgrade and the downgrade revision of Cobenfy’s initial $8B peak sales forecast to $2B. In deal 4, Roche accepted real, early stage clinical risk, with a full acquisition, but with a goal of not missing out on the fast-moving GLP-1/GIP market. Deal 5 is a mixed level of clinical risk, but the licensing deal shifted part of the financial exposure onto Daiichi Sankyo, after Merck’s earlier attempt to acquire Seagen was unsuccessful. This shows that this lever is independent of the first lever of governance. There is however a high interdependency between the asset-stage risk and the deal structure, where late-stage assets were paid in 100% cash up front, and clinical risks were offset by milestone-payments.

- The final lever is the therapeutic area strategy, where a distinction could be observed between product development and diversification. The theory of Ansoff (Ansoff, 1957) that diversification is more risky than product development has partially been confirmed. The commercial risk in Cobenfy, and the regulatory issues of Izervay in Europe show that the diversification adds extra risks, because of lack of knowledge in those therapeutic areas. It was observed that Roche's diversification was driven by a different strategic objective than Astellas' and BMS': Roche sought to establish itself as a key player in a high-growth market, while Astellas and BMS diversified primarily to de-risk their pipelines and offset pending LOE. This confirms that this third lever of therapeutic area strategy is also largely independent from the other two levers.

Answering the research question, there is no single strategy to mitigate the portfolio and pipeline risk across therapeutic areas. It concerns rather three independent choices, which can depend on the rationale behind the deal, the trust in the partner, and (most importantly) the opportunity. Even when there is a rational strategy, risk can never be eliminated altogether. While the literature on M&A in the pharmaceutical industry looks mostly to clinical risk, there have been different kinds of risks that were observed during these deals: commercial risk (BMS), regulatory risk (Astellas) and manufacturing risk (Merck). The sample size also nuances open innovation as described by Chesbrough (Chesbrough, 2003). While the M&A deals opened up the innovation by externalizing, this didn’t remain open. With the exception of the co-development deal (Merck), external sourcing only temporarily opened the innovation, and was quickly closed again into internal control.

# 4.CONCLUSION

## 4.1. BRIEF SUMMARY

In this thesis, the question was asked how the pharmaceutical companies structure M&A and licensing deals to mitigate the risk profile of the product portfolio and pipeline across the core therapeutic areas. To answer the question, a case study was done of 5 different deals, including four M&A deals and one licensing deal. Instead of finding one clear strategy, the case study showed that there are actually three largely independent different strategic levers:

- The governance structure, ranging from full M&A transactions up to licensing and co-development
- The asset-stage risk, going from an acquiree with commercial products or commercial-ready products up to acquirees who are in the early phases of clinical development. This strategic lever is interwoven with the deal structure, where extra clinical risks will be offset with milestone-payments, and low or no clinical risk will be paid in 100% cash
- The therapeutic area strategy, going from product development to diversification in a new therapeutic area.

## 4.2. STRATEGIC IMPLICATIONS

Rather than having one strategic handbook, which decides the whole strategy, this case study shows that there are three different strategic levers to decide on.

Related to the governance structure, the case study didn't confirm the findings of McKinsey (McKinsey, 2025) that non-M&A partnerships generally outperform M&A partnerships. In several cases, M&A can be preferential to non-M&A partnership as was evidenced by Merck being too dependent on the oversight of Daiichi Sankyo for the manufacturing of one of their compounds.

For asset-stage risk, going for a deal involving commercialized or commercial-ready products decreases effectively the clinical risk. However, in the case of BMS, we saw that the de-risking only applies to the clinical risk, but not to the commercial risk. In the case of Astellas and Merck, a regulatory risk was noticed, where a successful clinical product was stopped by (some of) the regulators (Merck) or stopped by the company after negative signals (Astellas). The findings from Büssgen and Stargardt (Büssgen & Stargardt, 2024) that deals for companies in early clinical stage work better could not be

confirmed, as for those deals, data of going successfully to Phase 3 is not yet available. The deals in early asset-stage from this case study were quite promising though.

For the therapeutic area strategy, the theory of Ansoff (Ansoff, 1957) could be noticed that product development (for Pfizer and for Merck) was generally less risky than diversification strategy. For Astellas, the credit rating was lowered after going for the diversification deal. For BMS, it was shown that the diversification lead to lack of knowledge of the new therapeutic area, and consequently an unsuitable commercial strategy. One exception is Roche, where the diversification was well received by the stakeholders. In this case however, the diversification was carefully chosen, and not with the goal to offset LOE, but rather to be a key player in a new successful therapeutical area.

In general, it can be noticed that the most successful deals from our case study were those where there were either product synergies with possible co-therapy (Pfizer), or the deal where the goal was not to offset LOE on short term, but to really break open a well thought market (Roche). In those deals where LOE quickly needed to be offset, the strategy behind the three discussed levers is more dependent on the opportunity, than on an actual pre-defined strategic plan.

As we noted in the introduction (section 1.1.4.2. and 1.1.4.3.), there are major regulatory pressures on the price of the medication. This structural pressure on the profitability is pushing companies to M&A activities, but it is very important to do this carefully and use the correct strategies.

## 4.3. AREAS FOR FUTURE RESEARCH

The limit of this thesis is that it concerns a case study of 5 well-described goals. Because of the shift of the pharmaceutical industry, it was decided to describe recent (post-COVID) deals. This has, however, the limit that it cannot describe the success of early-stage candidate drugs.

Future research on the same topic could take a larger sample for statistically testing the conclusions of McKinsey (McKinsey, 2025), and Büssgen and Stargardt (Büssgen & Stargardt, 2024). A follow-up within 5-10 years on the same deals could evaluate the value created by the early-stage drug candidates in the case study, and could check if the commercial goals for Astellas and BMS have been reached.

# 5.SOURCES


Allhoff, F. (2015, October 5). *Daraprim and Predatory Pricing: Martin Shkreli's 5000% Hike*. Stanford Law.

Ansoff, H. I. (1957). *Strategies for Diversification* (Vols. 35, No2, p. 85). Harvard Business Review.

Astellas Pharma. (2023, April 30). *Astellas Global Press release Astellas Enters into Definitive Agreement to Acquire Iveric Bio*. http://www.sec.gov

Astellas Pharma. (2025). *Astellas FY2024 financial results*.

Astellas Pharma. (2026, July 24). *Open Innovation Lab established in Astellas' Tsukuba Research Center*. Https://Www.Astellas.Com/En/Science/Research-and-Development/Open-Innovation/Sakulab-Tsukuba.

Bell, J. (2025, February 6). Bristol Myers gives first peek at closely watched launch of schizophrenia drug. *Biopharmadive*.

Bristol Myers Squibb. (2023). *US SEC 10K filing Bristol-Myers Squibb annual report 2023*.

Bristol Myers Squibb. (2024, March 18). *BMS acquires Karuna therapeutics*.

Brooks, K. (2023, October 20). Merck, Daiichi Enter Global ADC Alliance with Potential Value of $22B. *Contractpharma*.

Büssgen, M., & Stargardt, T. (2024). To merge or not to merge? The impact of mergers and acquisitions on corporate success in the pharmaceutical industry. *Managerial and Decision Economics*, *45*(4), 2196–2209. https://doi.org/10.1002/mde.4129

Carmot Therapeutics. (2023). *Carmot Therapeutics Launches Spin-Off, Kimia Therapeutics, to Focus on Metabolic Disease*. https://www.globenewswire.com/news-release/2023/01/05/2583779/0/en/Carmot-Therapeutics-Lau...

Chesbrough, H. (2003). *Open Innovation*. Harvard Business School Publishing Corporation.

Congressional budget office (US congress). (2021). *Research and Development in the Pharmaceutical Industry*.

Credendo. (2025, October 27). *Pharma sector: A changing US landscape will prove disruptive for the entire sector*. Sector News.

Cubanski, J., & Neuman, T. (2026, March 11). *Key Facts About Medicare Drug Price Negotiation*. KFF.

Daiichi Sankyo. (2023). *Daiichi Sankyo and Merck Announce Global Development and Commercialization Collaboration for Three Daiichi Sankyo DXd ADCs*.

Deloitte. (2026). *Deloitte: Navigating the GLP-1 boom Measuring the return from pharmaceutical innovation*. https://www.deloitte.com/uk/en/Industries/life-sciences-health-care/rese...

Dokomjilar, C. (2023, November 2). October 2023 Top Biopharma Deal: Daiichi Sankyo co-development and commercialization deal with Merck for 3 antibody-drug conjugates. *Dealforma*.

Dunleavy, K. (2025). Astellas reports 22% sales bump for Izervay, expects trend to continue this year. *Fiercepharma*. https://www.fiercepharma.com/pharma/astellas-reports-22-sales-bump-izervay-projects-trend-continue-year

Duysters, G., & Hagedoorn, J. (2000). Organizational modes of strategic technology partnering. *Journal of Scientific & Industrial Research*, *59*(9), 640–649.

Elfman, R. (2023, March 15). Seagen to Be Acquired by Pfizer. *Morningstar*.

Ghigini, E. (2024, June 8). Roche shares target increased by Berenberg on Carmot acquisition impact. *Investing.Com*.
González Peña, O. I., López Zavala, M. Á., & Cabral Ruelas, H. (2021). Pharmaceuticals Market, Consumption Trends and Disease Incidence Are Not Driving the Pharmaceutical Research on Water and Wastewater. *International Journal of Environmental Research and Public Health*, *18*(5), 2532. https://doi.org/10.3390/ijerph18052532
Grand View Research. (2026). *GLP-1 Receptor Agonist Market (2026 - 2033)* .
Higgins, M. J., & Rodriguez, D. (2006). The outsourcing of R&D through acquisitions in the pharmaceutical industry. *Journal of Financial Economics*, *80*(2), 351–383. https://doi.org/10.1016/j.jfineco.2005.04.004
https://data.worldbank.org/indicator/. (2026, July 12). *Inflation, consumer prices (annual %)*. Inflation, Consumer Prices (Annual %).
Iqbal, S. U., Podolskiy, D., Flores, M. G., Chiou, V. L., Sheng, J., Araujo, R., Afzal, N., Hall, D. A., Vasiliu-Feltes, I., Patel, D., & Kellis, M. (2026). Role of AI in drug development: Current status, challenges, opportunities, and future promise. *Artificial Intelligence in Health*, *3*(2). https://doi.org/10.36922/AIH025470103
IQVIA. (2026). *Global Medicine Use Trends, Therapy drivers, spending levels, and policy evolution*. https://ogc.iqvia.com/Contracts/LSA-0422
Iveric bio. (2023). *Iveric SEC 8K form*. https://investors.ivericbio.com/node/13561/html
Japanese credit rating agency. (2024). *Japanese Credit Rating Agency - Astellas Pharma Inc. (security code: 4503)*. https://www.jcr.co.jp/en/
Lauks, S., Ge, C., Luft, D., Perak Ross, Greenwalt, L., & Cattell, J. (2025). *The Rules of Loss of Exclusivity are Being Rewritten | IQVIA*. https://www.iqvia.com/locations/united-states/blogs/2025/07/the-rules...
Manalac, T. (2025, August 27). Pfizer Cuts 100 From Former Seagen HQ Amid 'Digital Enablement and Automation' Push. *Biospace*.
Masson, G. (2025, December 18). Fiercepharma patient deaths. *Fierce Biotech*.
McKinsey. (2025). *External innovation: Biopharma dealmaking to boost R&D productivity*.
Merck & Co. (2023). *Merck & Co SEC 10-K form*.
Merck Co. (2023, October 19). Daiichi Sankyo and Merck Announce Global Development and Commercialization Collaboration for Three Daiichi Sankyo DXd ADCs. *Merck Co*.
National Human Genome Research Institute. (2024, June 13). *Human Genome Project: fact sheet*. Https://Www.Genome.Gov/Human-Genome-Project.
National Institute for Health and Care excellence. (2025, December 1). *Changes to NICE's cost-effectiveness thresholds confirmed*.
Neumann, P. J., & Kim, D. D. (2023). Cost-effectiveness Thresholds Used by Study Authors, 1990-2021. *JAMA*, *329*(15), 1312–1314. https://doi.org/10.1001/jama.2023.1792
NIHDI. (2024). *Monitoring Of Reimbursement Significant Expenses (MORSE)*. https://doi.org/10.5281/zenodo.18154911
Parasrampuria S, & Murphy S. (2024, December). *Comparing U.S. and International Market Size and Average Pricing for Prescription Drugs, 2017-2022: Issue Brief* . Washington (DC): Office of the Assistant Secretary for Planning and Evaluation (ASPE). Available from: Https://Www.Ncbi.Nlm.Nih.Gov/Books/NBK611829/.
Pfizer. (2023a). *Pfizer Completes Acquisition of Seagen*. www.pfizer.com.
Pfizer. (2023b). *Pfizer US SEC 10K report 2023*. https://www.sec.gov/Archives/edgar/data/78003/000007800324000003...

Pharma.be. (2025, March 14). *Une nouvelle ère pour le remboursement des médicaments : la réglementation européenne en matière d'ETS est une réalité* .
Richardson, J., & Schlander, M. (2019). Health technology assessment (HTA) and economic evaluation: efficiency or fairness first. *Journal of Market Access & Health Policy*, *7*(1), 1557981. https://doi.org/10.1080/20016689.2018.1557981
Roche. (2025). *Roche Group - Finance Report 2024*.
Roche. (2026a). *Roche group Development pipeline*.
Roche. (2026b, July 1). *Roche to present new data advancing its obesity portfolio at the American Diabetes Association's 2026 Scientific Sessions*.
Scannell, J. W., Blanckley, A., Boldon, H., & Warrington, B. (2012). Diagnosing the decline in pharmaceutical R&D efficiency. *Nature Reviews Drug Discovery*, *11*(3), 191–200. https://doi.org/10.1038/nrd3681
Schuhmacher, A., Gassmann, O., McCracken, N., & Hinder, M. (2018). Open innovation and external sources of innovation. An opportunity to fuel the R&D pipeline and enhance decision making? *Journal of Translational Medicine*, *16*(1), 119. https://doi.org/10.1186/s12967-018-1499-2
Taylor, P. (2023, December 23). BMS wagers $14bn on Karuna's schizophrenia drug. *PharmaPhorum*.
Vinluan, F. (2023, October 20). Merck Missed on Seagen, But Comes Back With Potential $22B Daii. *MedCityNews*.
Waldron, J. (2024, May 16). Roche's $2.7B Carmot bet pays off with phase 1 weight loss success for GLP-1/GIP agonist. *Fierce Biotech*.
Zhou, X., & Tao, W. (2026). Artificial intelligence in drug discovery from advanced molecular representation to pipeline applications. In *Frontiers in Bioinformatics* (Vol. 6). Frontiers Media SA. https://doi.org/10.3389/fbinf.2026.1755843