COST OF FAILURE AND COMPETITIVENESS IN DISRUPTIVE INNOVATION

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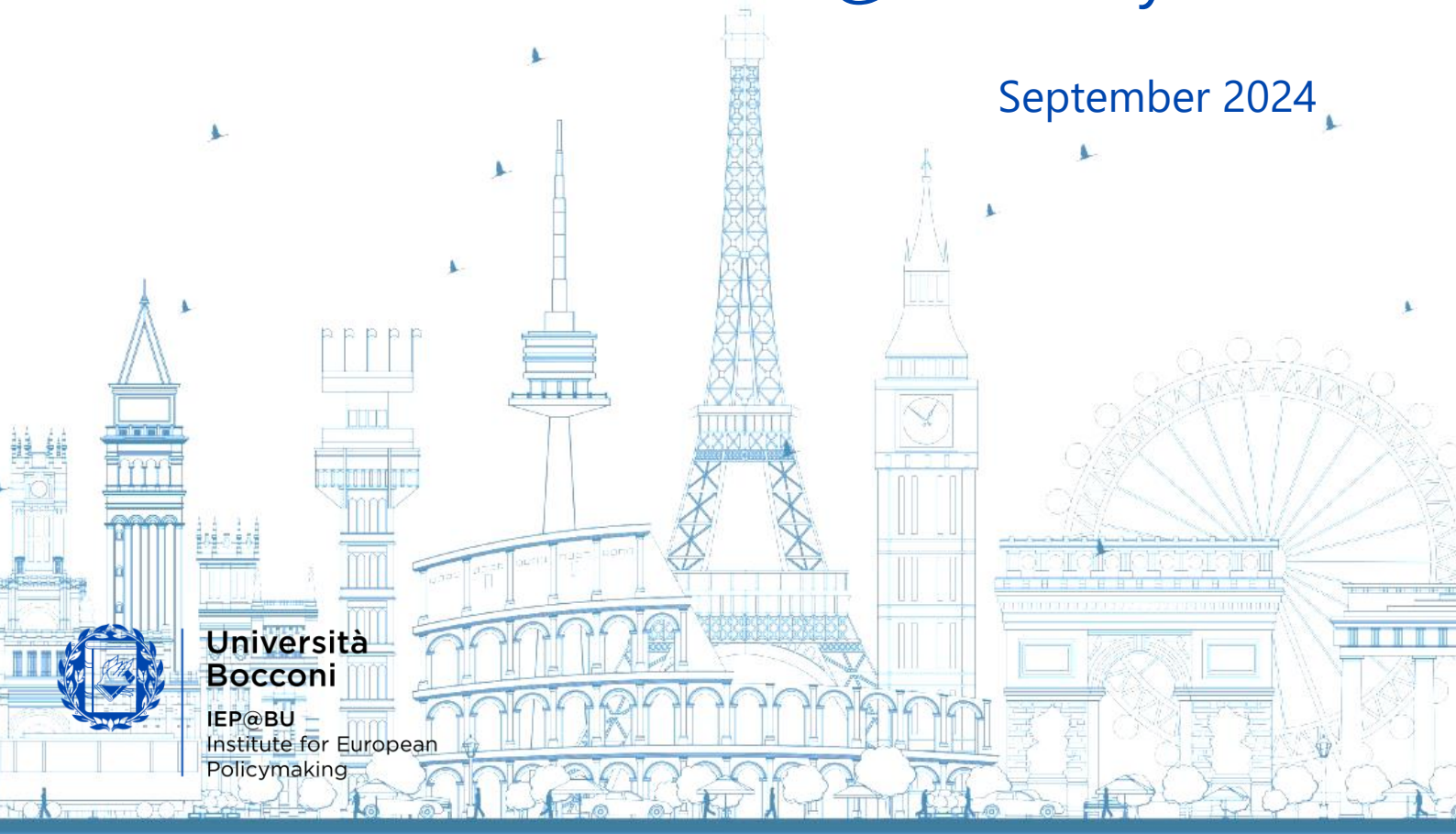

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Executive Summary[1]

We find that the profitability of high-risk tech companies, associated with high rates of failure, is very dependent on the cost of restructuring, which itself is driven by employment protection legislation. Leveraging a combination of financial analysis, empirical observations, and limited existing literature, we estimate that restructuring costs (that include much more than severance packages) are approximately 10 times higher in countries with high labor protection, such as in Western Europe, than in countries with low labor protection such as in the United States.

We show that this cost differential translates into lower returns on capital in tech industries and confirm that impact empirically. We explain that the cost of failure is a first order factor of Europe's lag in tech, with major consequences for its competitiveness, its standard of living and its security.

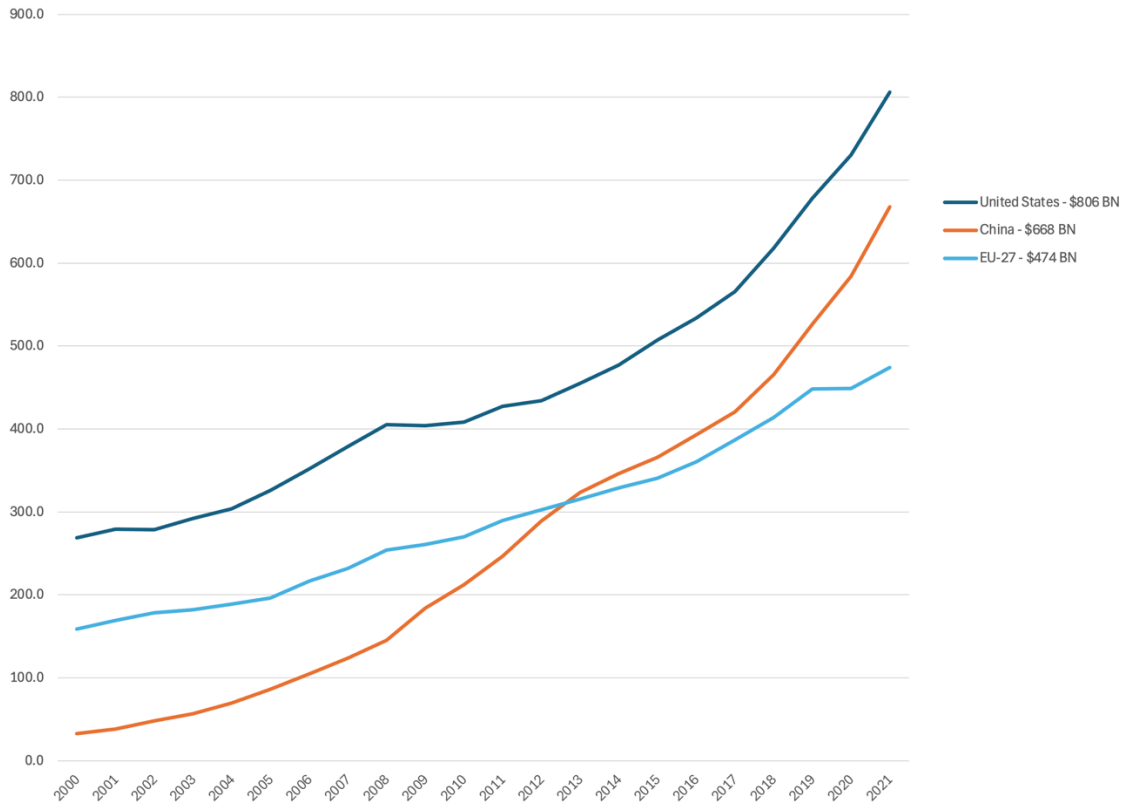
A key insight is that restructuring costs matter even if they apply only to larger enterprises because the high return from the few winners materializes only once they become larger. We propose reforms that would close Europe's growing gap with the United States and China without endangering the European social model.

[1]The authors are grateful to Jean Tirole from Toulouse School of Economics, Isabel Schnabel, Wolfgang Modery and Paloma Lopez-Garcia from the ECB, Alexandr Hobza and Pauline Rouch from the Draghi Mission on European Competitiveness, Olivier Blanchard from Paris School of Economics, Daniel Gros from the Institute for European Policymaking at Bocconi University, Olivier Guersent, Mario Nava, François Arbault, Andras Inotai, Jochem Brodersen, Massimo Gaudina, Roman Arjona, Valere Moutarlier and Anthony Whelan at the European Commission, Dan Andrews and Alvaro Pereira at the OECD, Gilbert Cette at Conseil d'orientation des retraites , Alain Durré at Conseil national de la productivité, Monika Schnitzer at the German Council of Economic Experts, Christoph Schmidt, Gerhard Kussel, Uwe Cantner and Florian Neubauer at the RWI – Leibniz Institute for Economic Research, Achim Wambach, Nicolas Ziebarth, Hanna Hottenrott, Yaming Cao at ZEW Mannheim, Thomas Philippon at NYU, Pierre Boyer at Institut des Politiques Publiques, Jeromin Zettlemeyer at the Bruegel Institute, Debora Revoltella at EIB for many stimulating discussions; to Enrico Letta, former Italian Prime Minister, Mathieu Landon and Paul Teboul at the Elysée Palace, François Villeroy de Galhau, Governor of the Banque de France, Nicolas Dufourcq, Paul Francois Fournier, Veronique Jacq, Philippe Mutricy at the Banque Publique d'Investissement, Pascal Lamy at Notre Europe, Louis Gallois at La Fabrique de l'Industie for helping us navigating the regulatory landscape; to Borje Ekholm, Patrick Pouyanne, Pierre Andre de Chalendar and other members of the European Round Table for Industry, Xavier Niel, Emmanuel Lagarrigue at KKR, Thomas-Olivier Leautier at TotalEnergies, William de Vijlder at BNP Paribas, Alf-Hendryk Wulf at VDE, Rolf Werner at Nokia, Frederic Schneider-Maunoury at ASML, Philippe Collombel at Partech, Francois Veron at NewFund, Eric Labaye at France 2030, Jerome Faul at Innovacom, Admiral Pierre Vandier at Etat-Major des Armees and Admiral Thibault De Possesse at CHEM, Jan Mischke at McKinsey for very useful industry and security insights.

Section 1 - INTRODUCTION

It is now widely understood that the R&D intensity gap of the European Union against the United States is driven by tech sectors:[2] the United States private R&D in tech is now 6 times higher than in the EU. [3] China's tech private R&D is now almost 2 times higher than in the EU, and its global R&D investment (private and public) is converging fast to the US level:

Figure 1: R&D per region, in billions of current PPP US dollars



Source: OECD/NFS[4]

The Australian Strategic Policy Institute reports that China has even taken a significant lead over the Western world in many areas:[5]" China's global lead extends to 37 out of 44 technologies that ASPI is now tracking, covering a range of crucial technology fields spanning defense, space, robotics, energy, the environment, biotechnology, artificial intelligence (AI), advanced materials and key quantum technology areas."[6] Europe's lag is particularly worrisome for its security, as China is both

[2] In this article, we define tech as Information and Communication Technologies.
[3] (European Commission, 2023)
[4] https://ncses.nsf.gov/pubs/nsb20246/figure/RD-10
[5] (Gaida, Wong-Leung, Robin, & Cave, 2023)
[6] It should be noted that data on AI R&D investment or quantum Computing patents are very difficult to assess precisely – many reliable sources (governments, consortiums, universities) show significant divergences.

a crucial economic partner and a geopolitical competitor striving for global dominance in tech, in direct confrontation with the United States.[7]

This article shows that Employment Protection Laws (EPL), while less often discussed than R&D subsidies, fragmentation of the market or financing, are a first order determinant of the innovation taking place at the technology frontier (we will often call it “radical innovation” or “disruptive innovation”) and can explain a major part of the gap between the United States and Europe in tech, which has been at the center of most disruptive innovations over the last 4 decades.

Before focusing on labor protection, it is worth explaining briefly why other macro-economic factors may not be as important as usually thought in the context of innovation, even though they may be central in other areas - for instance pan-European pension plans would certainly contribute to the prosperity of the Continent, but they are not necessarily a condition to attract more investors in European tech projects.[8]

Stating that Europe is lacking entrepreneurial culture simply ignores history, its vibrant capitalistic successes, the quality of European ecosystems, the persistence of multiple champions in many industrial sectors, not to mention the exceptional diaspora of European executives and engineers across the world.

Is market fragmentation more relevant? What can be seen as obstacles in more traditional industries, such as tariffs, regulation and transport costs, does not necessarily apply to the tech sector, where most of the radical innovation is taking place: transportation costs are negligible for semiconductors and non-existent for software, cloud services or artificial intelligence. Customs duties are either absent (as in the case of cloud services or SaaS) or minimal.

In some key domains like telecom equipment, semiconductors or cloud services, regulations play a non-decisive role, as technologies change so fast that standards are typically established by dominant market players or consortia, rather than by governments.

In fact, some of the more serious European market issues have more to do with the application of tech to specific regulated sectors like banking, healthcare or transportation, rather than the development of tech solution. And the examples of Israel, Taiwan or South Korea provide a compelling argument as to how tech companies can thrive globally without a significant domestic market.

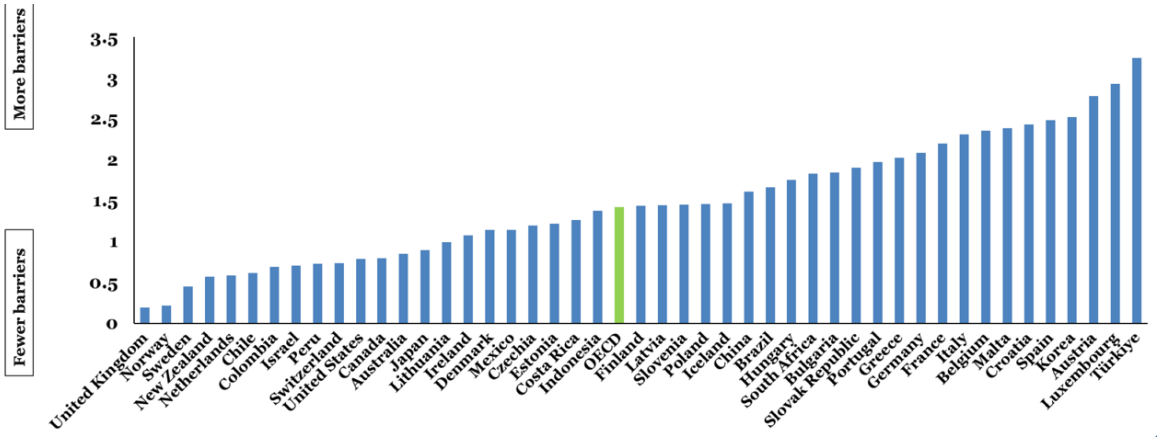
Does Europe regulate more than the United States? The answer is certainly not trivial. Very often the EU and member States tend to regulate “ex ante”, i.e. before harm has happened, while the US authorities, much more sensitive to corporate pressure, tend to regulate “ex post”, once harm has been done and causes public outrage. Conversely, the legal risk in the US is often considered as much higher than in Europe. But certainly, the European appetite for security and caution can lead to excessive regulations for any industry.

Promoting a more level playing field competition in Europe would most likely improve the performance of most firms. In particular, there are still too many barriers to entry in service sectors: they include administrative burdens, heavy regulation of multiple professions, seasonal sales,

[7] (Coste, 2022)
[8] We analyze all these factors in much greater detail in (Coatanlem & Coste, 2023) and in (Coste, 2022).

advertising. They also stem from lack of regulation in some critical areas, such as the concentration of digital markets. As shown by the OECD, many European countries perform significantly worse than the OECD average:[9]

Figure 2: OECD Product Market Regulation Indicator measuring barriers to competition in service sectors



Source: (OECD, 2024)

Public subsidies are another debated area, especially since the introduction of the largely misnamed Inflation Reduction Act and the semiconductor CHIPS and Science Act in 2022. There certainly exist significant structural differences between Europe and the United States, in no small part due to the importance of the Defense budgets in America and the powerful influence of the Defense Advanced Research Projects Agency, known as DARPA and responsible for the implementation of so many long-term tech projects. Yet, DARPA's budget for 2024 is $4.1 billion, in stark contrast with the $330 billion in R&D investments made by US tech companies. And overall public investment in R&D in the US is moderately higher than in Europe (EU plus UK and Switzerland) in absolute terms, but R&D public investment relative to total investment is higher in Europe than in the US.[10] Again, the shocking gap is the level of private tech R&D investment in Europe, 6 times below that of the United States!

Finally, let's look at the issue of funding. On the surface, the United States seems to have a tremendous advantage, with far more developed capital markets in general and more vibrant VC funds in particular: in Europe, entrepreneurs actively seek out funds, whereas in the US, funds actively seek out entrepreneurs. Yet, private capital doesn't chase local opportunities, it just favors superior returns.

We can observe American funds establishing significant teams in cities like London and other European capitals to capitalize on investment opportunities in Europe.[11] We view the lack of funding

[9] (OECD, 2024)
[10] See (Coste, 2022) and (Fuest, Gros, Mengel, Presidente, & Tirole, 2024)
[11] See for instance: https://pitchbook.com/news/articles/2022-us-vcs-europe-deals

as a result of reduced profitability, rather than a cause of under-investment (more on that in Section 3).

And even if all these factors were more significant than we think, it is striking than none of them seem to have prevented the emergence of European leaders in mature, lower-risk industries like automotive or aeronautics, with Europe maintaining a world leading level of R&D investment in such sectors.

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In this article, we will justify our thesis from four different perspectives. In Section 2, we leverage academic research and model-based approaches to understand the dynamics between EPL and innovation at the technology frontier. In Section 3, we analyze firm-level data based on public or restricted information to calibrate the restructuring cost differential between the United States and the European Union, and we look at ex-ante profitability of innovation projects as a key determinant of their viability. In Section 4, we compare predicted profitability to ex-post profitability based on large groups and VC funds historical data. Section 5 details the kind of more granular data that would be greatly beneficial to the research community and policy makers to design more effective EPL within the European Union. Finally, Section 6 envisages several key reforms.

Section 2 - IN SEARCH OF CAUSALITY

There exists an ample literature on the relationship between labor market institutions on the one hand, and growth and employment on the other hand. In particular, it is widely accepted that European-style labor protection is associated with higher unemployment:[12] insiders are protected to the detriment of outsiders seeking to enter the workforce.

A real-life illustration of these dynamics was provided by the significant switch operated in 2009 by Australia from a Denmark-type EPL to a model closer to France or Italy. Confronted with tighter dismissal laws, firms had to reduce turnover (firing and hiring) of protected workers and compensate by hiring more unprotected workers (e.g. in temporary contracts); they also increased their use of physical capital, outsourcing and offshoring. A consequence of this change of EPL was that firm productivity fell by 1.2% in average and wage growth weakened.[13] Ultimately, this is an example of protecting workers, not jobs.

Academic research analyzing the impact of EPL on innovation is much more limited. In a seminal paper, Gilles Saint-Paul has shown that high firing costs tend to direct R&D investment towards mature products rather than new ones.[14] In an open economy, countries with high levels of employment protection tend to specialize in well established industries and leave innovation of new products to countries with less employment protection.

[12] See for instance (Blanchard & Wolfers, 2000)
[13] (Andrews & Buckley, 2023)
[14] (Saint-Paul, 2002)

Saint-Paul notes that the specialization triggered by labor laws doesn't necessarily impact growth and employment: in fact, a cross-sectional analysis seems unlikely to show any negative impact.[15] However, worldwide welfare decreases as employment protection increases in Saint-Paul's model. Furthermore, as shown in (Griffith & Macartney, 2014),[16] employment protection can increase the level of innovation at a country level, measured as overall patenting, in the case of "marginal innovation", that doesn't require new technologies and new products. But, in parallel, an increase in employment protection would also result in a decrease in "radical innovation", that requires entirely new technologies and new skills. As a consequence, "multinational firms do locate radical patenting activity disproportionately in low-EPL countries."

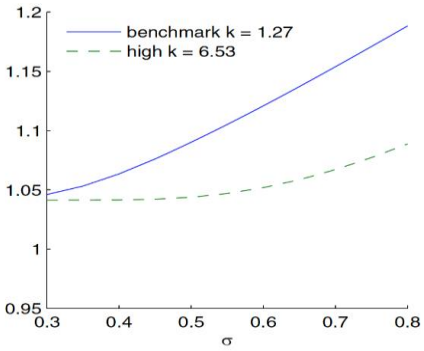
Yet, these papers, while establishing a strong relationship between employment protection and disruptive innovation, don't say much about the impact of the other factors on investment in innovation we discussed earlier, the very same factors that are currently being debated within European and national institutions and cover a broad set of economic weaknesses, from lack of financing to market fragmentation and regulations often perceived as excessive.

While we showed that the importance of these factors, taken in isolation, was often weak, the cumulative effect is less clear. So, the question boils down to: is employment protection a first order impediment or a reason amongst many others of the lagging of frontier technologies in Europe?

A more ambitious article clarifies this point and shows indeed that the proposed model, calibrated to a large set of data, can explain a very significant portion of the relative slowdown in productivity in the EU.[17]

As illustrated below, at low level of risk (noted sigma) the cost of failure (noted k and function of Employment Protection Laws) has very little impact on productivity. But as we are approaching frontier technologies, associated with a much higher level of risk, the productivity gap with the US increases significantly:[18]

Figure 3: Productivity level as a function of risk (sigma) for different levels of cost of failure (k)



Source: (Bartelsman, Gautier, & Wind, 2016)

[15] See (Nickell & Layard, 1998)
[16] The authors build their model on the creative destruction framework of (Aghion & Howitt, A Model of Growth Through Creative Destruction, 1992) and (Aghion & Howitt, Endogenous Growth Theory, 1998)
[17] (Bartelsman, Gautier, & Wind, 2016)
[18] As Paul Krugman famously said 30 years ago, "productivity isn't everything, but in the long run it is almost everything."

Incidentally, the authors calibrate the ratio of cost of failure between high-EPL and low-EPL countries at approximately 5. While this ratio is simply estimated based on macro-level data (and not measured empirically as we do in Section 3 of this article), its magnitude is an indication that the cost factor is unlikely to be second order.

Similarly, another model by Roberto Samaniego confirms that EPL has a more negative impact in industries where changes are volatile and fast, such as in Information and Communication Technology (ICT), and also predicts that "the industry composition of a country with strong job security policies will be skewed away from ICT, and skewed towards industries in which technical change is slower."[19]

Bozkaya and Kerr analyze the impact of Labor regulations on the European Venture Capital and reach similar conclusions.[20] Leveraging several million records of public and private European companies from Bureau van Dijk's Amadeus database (now part of Moody's) that include whether or not private equity investors are part of the shareholders, and also Thomson's deal-level database, the authors found evidence that strict labor regulations, combined with high labor volatility generated by radical innovation, hinder Venture Capital investment: employment protection "directly taxes labor force adjustments, and VC investors are especially sensitive to this choice given the sectors in which they operate and their business models."

Looking at another aspect of EPL, the legal trial period for new employees, another paper reaches a conclusion in line with previous papers: too restrictive trial periods limit the ability of companies to properly screen their employees and incentivize them to minimize human capital and specialize in marginal innovation rather than disruptive innovation.[21]

Interestingly, the OECD has attempted to simulate the impact of making the EPL of a given country converge to the OECD average. In the case of the Czech Republic, the OECD estimated a 1.6% productivity growth for the firms in the quartile closer to the technology frontier; for Greece, the impact was about 1% of productivity growth.[22] Conversely, this shows that "stringent EPL might adversely affect the growth potential of more productive firms and weaken post-entry growth". "Stringent EPL is significantly associated with lower ability of innovative firms to attract the complementary tangible resources that are required to implement and commercialize new ideas, and the burden of this effect falls disproportionately on young firms, which are more likely to experiment with radical innovation."

Another study shows the impact of simulating a switch from European type EPL to US type EPL (regardless of whether it is socially or politically desirable): R&D Capital Intensity[23] would increase by more than 50% in France, 40% in Italy or Spain, more than 30% in Germany.[24]

[19] (Samaniego, 2006)
[20] (Bozkaya & Kerr, 2014)
[21] (Berdugo & Hadad, 2008)
[22] Section 4.3 of (McGowan, Andrews, Criscuolo, & Nicoletti, 2015)
[23] Ratio R&D capital over Labor
[24] (Cette & Lopez, 2018)

At this stage, we should note that most academic papers listed above use the OECD Employment Protection index[25] (or something equivalent) as a proxy for estimating restructuring costs.[26] But obviously, a model calibrated to firm level costs would be much more realistic and accurate. We will discuss the availability of more granular data in Section 5. While the qualitative results of these papers seem robust and converging, we will now follow a more empirical approach to determine the magnitude of the cost of failure, and measure its impact at investor level, therefore qualifying better its importance vs other factors more commonly mentioned for Europe's lag in tech.

Section 3 - EX-ANTE PROFITABILITY

The key determinant in deciding whether to invest in a project is evaluating its return on capital relative to some measure of the risks taken. Needless to say, the risks associated with a project at the technology frontier are significant for all kind of financial, technical or even geopolitical[27] reasons. By some estimate, about 80% of projects started by large tech companies fail.[28] In this context, the cost of failure - that is, the expense of shutting down unsuccessful projects and launching new ones – becomes a critical element in profitability analysis.

A second important consideration is that the workforce involved in these tech projects is typically highly qualified and, consequently, highly compensated. This often leads to increased human capital related restructuring costs, further impacting the overall financial cost.

Thirdly, disruptive innovation, with its massive reallocation of human and physical capital, predominantly occurs in very large companies, such as the "Magnificent Seven" in tech. In the United States, a significant portion of corporate R&D - 66% of the total $600 billion budget in 2021 - originates from companies with more than 5,000 employees. Notably, 82% comes from companies with over 1,000 employees, and 90% from those with more than 250 employees.[29]

According to the World Intellectual Property Organization, the concentration of intellectual property has surged over the last 20 years. The R&D expenditure of the world's top 2,500 companies has increased more than four-fold,[30] while global R&D spending has grown at a much slower rate - only 30% relative to GDP in the last decade.[31] Not surprisingly, this concentration is also evident in patents: the top 100 companies accounts for 27% of patent filings, hold 22% of the patents currently in force, and receive 35% of the world's patent citations.[32] The average patent dollar value is typically

[25] https://www.oecd.org/en/data/datasets/oecd-indicators-of-employment-protection.html
[26] Note there exist alternative tools in the private sector, for instance Deloitte provides detailed simulations for different types of job in individual scenarios: https://www2.deloitte.com/ch/en/pages/legal/articles/international-employment-law-guide.html.
[27] For instance, because of the scarcity of certain components
[28] See (Coste, 2022): this estimate is based on our own professional experience and on exchanges with tech executives.
[29] Source: US government: https://ncses.nsf.gov/pubs/nsf23350
[30] (Bonaglia, León, & Nindl, 2024)
[31] Source: innovation intelligence firm Patsnap: (Patsnap, 2023)
[32] (Patsnap, 2023)

an order of magnitude higher in the top 25% of firms than in the bottom 25%.[33] Moreover, there is also evidence that both R&D spending and productivity increase with firm size.[34]

Because of these size effects, restructuring is typically very sensitive to regulatory, legal and political interference. In Europe, EPL is generally much stricter for large companies compared to smaller ones. This environment leads to delays that are hard to predict precisely but can easily extend over several years.

As a result of these factors, when companies are required to restructure, they must provision far more than just redundancy packages for highly paid employees. They must also account for various operational losses caused by the uncertain and prolonged transition to a new business model. In many European countries, such as Germany, France, Italy, the Netherlands, Sweden, and the UK, large companies must engage in extensive negotiations with trade unions and works councils. These discussions cover the scope, motivations, timing, team selection for redundancies, severance pay, and in some cases, employee retraining or support for finding new jobs.

As we highlighted in an article for the Financial Times, human capital related restructuring costs in Western European countries are typically an order of magnitude higher than in the United States. [35] The recent wave of tech layoffs illustrates key structural differences between the European and American models. For instance, in the U.S., Microsoft laid off 10,000 employees in January 2023, [36] with severance costs totaling $800 million, or $80,000 per employee, equivalent to 5.9 months of median compensation. Similar figures were observed[37] for Meta (4.2 months), [38] Google (7.5 months), [39] and Twitter (3 months).[40]

What stands out in the American model is the agility of corporate decision-making. The rapid success of ChatGPT triggered immediate responses: Microsoft streamlined its workforce, invested $10 billion in OpenAI, and more in its own AI infrastructure. Meta paused its metaverse efforts, laid off 20,000 employees within months, and boosted its AI investments, spending a whopping $37 billion on computing infrastructure in 2024. [41] Similarly, Google, facing challenges in search, halted major projects, laid off 12,000 employees, and accelerated on AI by ramping up its R&D investments to $43bn in 2023, including hiring tens of thousands of engineers with AI background.

In Europe, the three tech leaders - Nokia, SAP, and Ericsson - also announced restructuring plans. Nokia, the largest European tech investor, presented a headcount reduction of up to 14,000 employees.[42] Despite a sharp 21% sales decline last year necessitating immediate action, regulatory constraints in Germany, France, and Finland mean it won't complete the restructuring until 2026. Similarly, SAP, Europe's software leader, announced 8,000 layoffs, [43] provisioning over 18 months of compensation globally, with more than three years required in Europe. Meanwhile, SAP's

[33] (Arora, Cohen, Lee, & Sebastian, 2022)
[34] (Knott & Vieregger, 2020)
[35] (Coatanlem, 2024)
[36] https://www.microsoft.com/investor/reports/ar23/index.html
[37] https://www.clubpraxis.com/en/restructuring-data
[38] https://investor.fb.com/financials/sec-filings-details/default.aspx?FilingId=17229405
[39] https://abc.xyz/assets/95/eb/9cef90184e09bac553796896c633/2023q4-alphabet-earnings-release.pdf
[40] https://gizmodo.com/elon-cuts-costs-by-laying-off-the-people-who-make-money-1849955413
[41] https://www.datacenterdynamics.com/en/news/meta-plans-37bn-digital-infrastructure-investment-in-2024/
[42] https://www.nokia.com/system/files/2024-01/nokia_results_2023_q4.pdf
[43] https://www.sap.com/investors/en/reports.html?sort=latest_desc&tab=reports

AI investment is limited to $0.6 billion annually, [44] a stark contrast to the tens of billions spent by the Magnificent Seven.

These figures highlight an additional difficulty derived from Employment Protection Laws: they usually prevent companies from hiring during the period of negotiation of the collective dismissal plans (typically 1 year or more), and beyond the actual laying off of employees (typically one additional year).[45] This means that European companies cannot hire appropriate talents for new opportunities for 2 to 3 years, while American companies have the agility to restructure one team and hire another at the same time, as we've seen with Meta above. In tech, being 2 to 3 years late on a nascent market often means death.

Further investigation is needed to confirm this diagnosis. However, the examples provided align with our professional experience in managing tech businesses at firms like Atos and Alcatel-Lucent, in government roles, and through discussions with tech executives, as presented in (Coste, 2022). The complexity of restructuring in Germany, for instance, can be illustrated by the 2-year plan announced in 2023 by Volkswagen for its software activities:[46] "the plan still requires approval from the works council, which has guaranteed jobs for workers till mid-2025."

Potential restructuring costs are always factored into a business's valuation, whether in the event of failure or success, as large companies continuously seek economies of scale by streamlining activities like financial control, accounting, supply chain, and even sales and marketing. The high cost of failure, coupled with the high failure rate mentioned earlier, significantly impacts the valuation and projected internal rate of return (IRR) of projects.

Let's illustrate this point. Conservatively assuming restructuring costs equal 4 months of compensation in the United States and 2 years in Europe, with compensation typically representing 30% of revenues in tech businesses, the cost of failure amounts to 10% of revenues in the U.S. and 60% in Europe. If the market values a successful tech activity at 100% of revenues (10 times an EBITDA of 10% of revenues), a large U.S. company can launch 5 projects, with 4 failures, and still profit (1x100 – 4x10 = 60). In Europe, the same scenario results in a loss (1x100 – 4x60 = -140), discouraging investment in risky projects in Europe. [47]

Therefore, a large company would have positive ex-ante profitability for tech investments in the United States but negative profitability in Europe, solely due to restructuring costs. This is a crucial finding. The same logic indicates that the ex-ante profitability of low-risk investments is positive in Europe: assuming a 33% failure rate, a company launching 3 projects would see a positive return (2x100 - 1x60 = +140). This confirms that European firms are incentivized to pursue marginal rather than disruptive innovation, as discussed in Section 2.

Let's shift focus to startup companies, which, unlike larger groups, aren't as burdened by significant restructuring costs in Europe. Why should EPL have an impact on them? Because restructuring costs impact the profitability of venture capital (VC) funds. Such funds typically invest in 10 companies and generate high returns on investments on 1 only.

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[44] https://www.youtube.com/watch?v=5g1pGGhwPtA
[45] In France for example, this prohibition extends to one year after the last departure of dismissed employees.
[46] https://insideevs.com/news/693654/volkswagen-group-cariad-job-cuts/
[47] A more accurate model based on multi-year business cases is detailed in (Coste, 2022).

Therefore, the exit price of the 1 successful startup company is critical. The most likely buyers are large groups, who will logically consider that the acquired company could fail and who would then have to pay for the restructuring costs of the acquired workforce. Buyers will therefore integrate a portion of possible restructuring costs in their acquisition price. We can show that reducing the exit price by 50% of the potential restructuring costs have a major effect on the Internal Rate of Return (IRR) of the VC fund: the high cost of failure leads to a 4-point decrease of the ex-ante IRR of European VC funds vs American ones. [48]

Section 4 - EX-POST PROFITABILITY AND PERFORMANCE

For large groups, who finance the vast majority of R&D investments,[49] we have just seen that the cost of failure can explain an expected positive profitability in tech sectors in the United States and a negative one in Europe. How does that compare with reality?

First, there is ample evidence that return on invested capital (ROIC) of large European companies lags that of their American counterparts. Based on a sample of 2,200 companies across the world with revenue above $1 billion, a study by McKinsey shows that between 2014 and 2019, European companies are 20% less profitable, with an average return of 12.5% vs. 15.6% in the US. [50] Furthermore, 90% of this ROIC gap was created by tech-creating industries.[51] Those industries, that include ICT and pharmaceuticals, also account for more than 80% of the gap on capital expenditure, more than 60% of the revenue growth gap, and over 70% of the R&D investment gap. Corporate valuations have also followed the same trend: up 8.5% per year in average over 2000 – 2021 in the US, vs. only 4.3% in Europe. These numbers seem to confirm the magnitude of the profitability gap predicted in Section 3.

Even more worrisome is the fact that the dynamics at play are not in favor of Europe: as McKinsey puts it, “the potential penalty for lagging on innovation and key technologies is rising.” We have a confirmation of the strong concentration we saw in the previous section in intellectual property and R&D: not surprisingly, concentration extends to profitability.

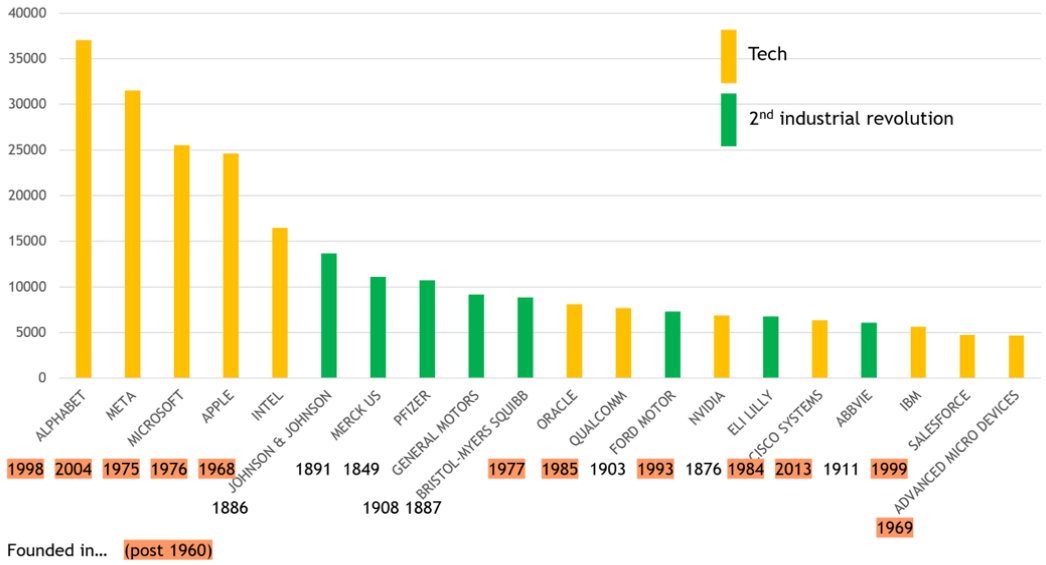
Based on an analysis conducted in 2019 of nearly 6,000 of the world’s largest public or private companies, with revenues of more than $1 billion, McKinsey found that 10% of firms generate 80% of total profits, while the middle 60% of these presumably “superstars” recorded a near-zero profit on average.[52] This shows that the more Europe delays addressing its structural weaknesses, the more difficult it will be to close the profitability gap.

Another trend predicted by theory (see Section 2) is the specialization of Europe in non-tech industries. We can observe empirically that most top European companies today are far away from

[48] (Coste, 2022)
[49] See Section 3.
[50] (McKinsey Global Institute, 2022)
[51] The same study shows that the contribution of tax effects is much smaller, about 6% of the gap.
[52] (McKinsey Global Institute, 2019)

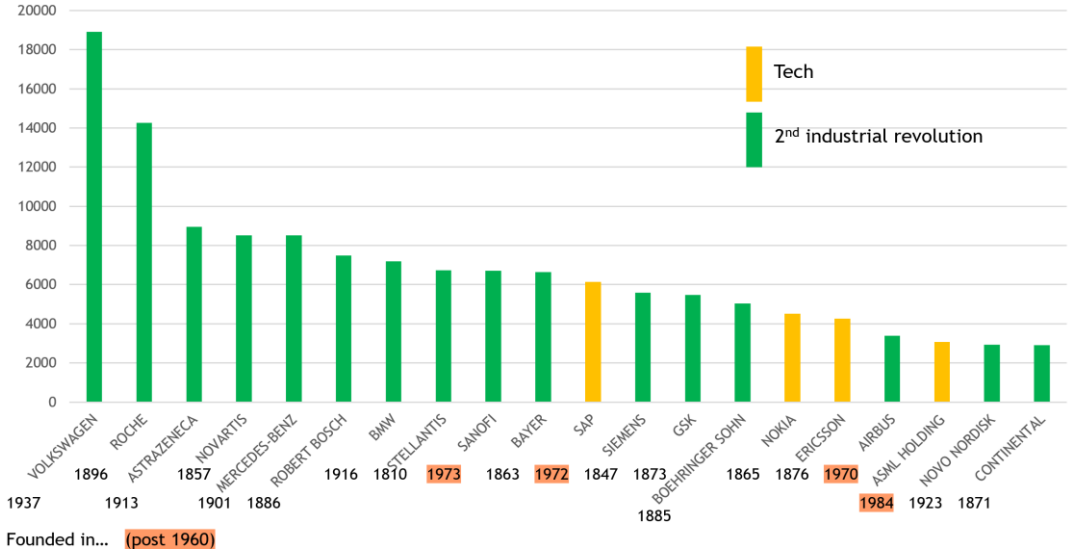
the technology frontier, while leading American companies are almost all recent firms investing massively in radical innovation: the United States is specialized in tech industries, Europe in legacy, second industrial revolution industries.

Figure 4: US leading investors in R&D (in millions of euros), 2022



Source: authors and European Commission[53]

Figure 5: Europe leading investors in R&D (in millions of euros), 2022



[53] (Coste, 2022) and (European Commission, 2023)

Source: authors and European Commission[54]

Based on detailed figures from the European Commission, gathering the R&D budgets of 2500 firms around the world, we could find that R&D investments by American companies amount to 300 billion euros in 2022, vs 54 billion euros for European companies (including UK and Switzerland).[55] Moreover, we know from professional experience that the leading European investors in tech (Ericsson, Nokia, SAP) are more focused on incremental innovation, improving products generations after generations but not disrupting industries like Google, NVIDIA or OpenAI.

In non-tech industries, we found that American companies invest 226 billion euros in R&D, while European companies invest 238 billion euros, which are mostly derived from the 2nd industrial revolution around 1900 and have reached a level of maturity where innovation is mostly incremental.

Europe's excellent performance in mature industries, by opposition to its very poor standing in disruptive tech, confirms the relevance of the cost of failure as a key factor, while the other causes mentioned in Section 1 cannot be the only explanation for such a contrasted situation.

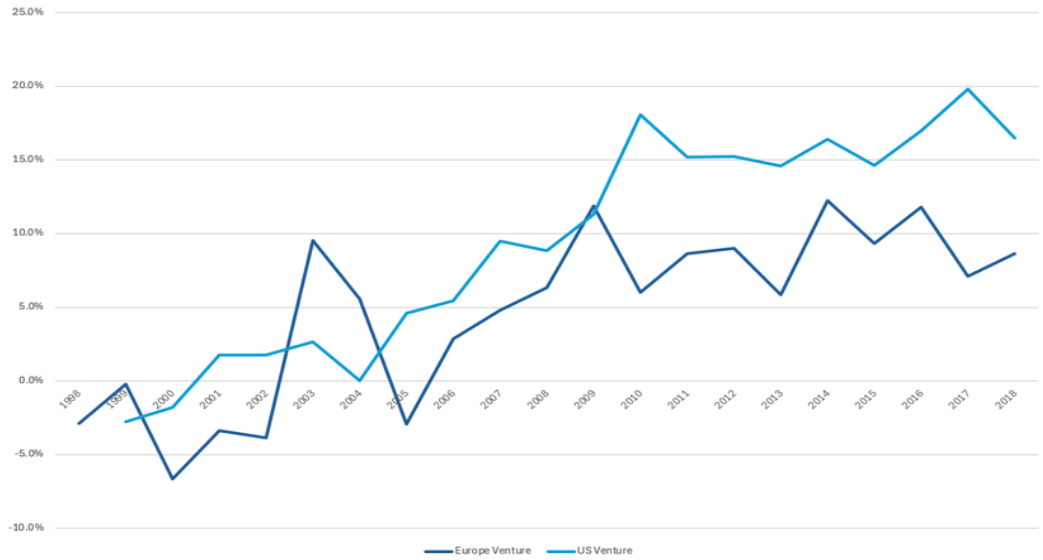
Let's now move to the situation of smaller tech companies, the potential "disruptors". In the case of startup companies and VC funds, we can empirically validate the expected IRR differential estimated above with IRR observed historically. The profitability of venture capital funds is mainly ensured by exits, i.e., the sales of startups either on the stock market (IPOs) or to large groups. So, let's investigate whether there is a valuation gap between an exit in the United States and an exit in Europe.

Following the recommendation of a few large VC funds, we use historical VC data from two main providers: eFront Pevara for Europe and Cambridge Associates for the United States, as they each cover a large enough set of VC funds in each surveyed continent to be representative. We look at performance per vintage year, and for each vintage we compute the median IRR and First Quartile IRR.[56]

Over a span of 25 years, from 1998 to 2022, the IRR of US VC funds has consistently been significantly higher than that of European VC funds. On average, during this period, the median IRR in the US was 9.43% and 4.38% in Europe. During the same period, the average IRR of the upper quartile was 15.50% in the US and 10.38% in Europe. In both cases the difference in IRR is about 5%, very close to the estimate provided above.

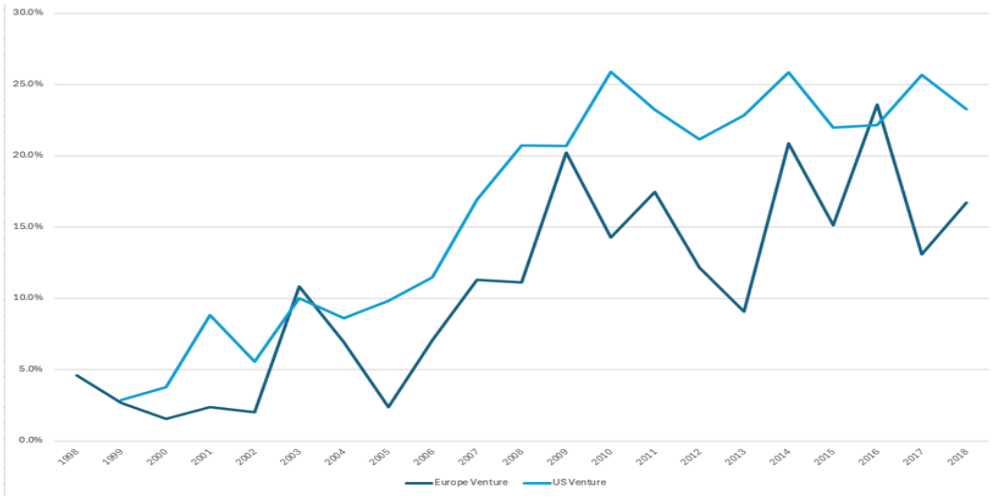
[54] Ibid.
[55] (European Commission, 2023)
[56] It is probably better to look at IRR in terms of vintage and not to pool funds by 'horizon returns", as the exit time can vary but is typically short dated.

Figure 6: Median IRR since inception by vintage year up to 2022



Source: authors calculation based on eFront Pevara and Cambridge Associates data

Figure 7: Top Quartile IRR since inception by vintage year up to 2022



Source: authors calculation based on eFront Pevara and Cambridge Associates data

The above gap in profitability may be a solid explanation for the lower level of funding for startup companies in Europe: less profitable European VC funds raise less money globally from LPs and therefore invest less money into European startup companies. Indeed, over the last 8 years, European startups have raised three times less funding than American ones ($50 bn vs $150 bn per year in average).[57]

[57] Source: Crunchbase and (Coste, 2022)

What is the fundamental reason behind this profitability lag? As we show in Section 3, is EPL related to large firms directly affects their appetite to buy startups: the acquisition price will be adjusted down by the (high) marginal restructuring cost of the buyer rather than by the (lower) average cost of the acquired company. This has direct negative consequences on the profitability of VC funds, and therefore on the availability of capital for younger firms.

From a policy perspective, this shows the importance of targeting larger firms. This seems counterintuitive: a lot of new legislation in European countries in the last 20 years or so was introduced on the basis that smaller companies were creating most of the new jobs in the economy.

We argue that focusing on the aggregate costs of restructuring for large innovative firms, in all the dimensions we described above, is key to scale up all companies for success at the technology frontier. Even if some cost components may be less material at an early stage of a company's development, the anticipation of those costs in future investments and of the lack of profitability of scaling-up, will make it hard for young firms to invest in radical innovation when they grow.

Section 5 - THE NEED FOR MORE GRANULAR DATA

At this stage, we were able to confirm the important impact of the cost of failure on European competitiveness and Europe's poor presence in tech, either via converging academic models, but using mostly qualitative EPL data, or based on reliable, but limited, real life detailed examples of restructuring costs. We believe that expanding the EPL models to account for a highly multi-dimensional set of firm-level data would certainly make our conclusions more robust and allow us to quantify more precisely the competitiveness gap.

As we already mentioned, the regulatory requirements prescribed in the EPL don't give the full picture. First, although rule-based in principle, the practical implementation can easily be delayed for all kind of administrative, legal or political reasons. Second, the total human capital cost goes far beyond the mere compensation of employees for the loss of their position: it includes the transition cost for the firm to move from its legacy production model to a new paradigm. Overall, the more employees are laid off the greater the restructuring costs on a prorate basis.[58]

Unfortunately, governments do not currently know the full extent of structuring costs at a firm level.[59] This lack of data is a logical consequence of their sensitivity. When facing the need to restructure their teams, companies have to engage in long negotiations with trade unions and work councils, country by country. The outcome of such negotiations is always kept confidential because it could otherwise be used as a precedent in further rounds.

However, all large companies must calculate their restructuring costs precisely, because of their obligation to publish worldwide provisions to their shareholders according to the rules applicable to

[58] (Kramarz & Michaud, 2004)
[59] This was confirmed to us by multiple public agencies, in particular the French Labor Ministry, the French Finance and Economy Ministry, INSEE, the German Council of Economic Experts, France Stratégie, the Conseil d'Analyse Économique, as well as DG Employment, DG Research and Innovation and DG Internal Market at the European Commission.

publicly traded companies.[60] The total amount of provisions is always mentioned in the financial results, but it never details the restructuring costs per country, nor does it give the corresponding number of redundancies per country. Thus, the actual cost per person and per country is usually not known.

Confidentiality is a key hurdle to overcome. Any data gathering on this topic needs to provide the companies with a framework that protects the secrecy and the sensitivity of their information. Moreover, some companies may be reluctant to disclose such information to any third party, and a mandate by a public authority is likely to be required. Cooperation with administrations like statistical offices, ministries of labor or ministries of economy may be necessary in the relevant European countries.

The other sensitive data is the level of total compensation per employee and per country. For relevant international comparisons, the research will need to gather data on the distribution of the salaries of the workforce country per country. Again, such data is very sensitive and will not be shared by companies without appropriate guarantees of confidentiality.

Even accessing public data can be a challenge in certain countries, as highlighted by the Aghion – Bouverot Commission on AI. In France in particular, the National Commission on Informatics and Liberty (CNIL) typically requires lengthy pre-approval processes for researchers to exploit data from public institutions such as INSEE. A better approach would be that of the EU General Data Protection Regulation (GDPR), where the control is more ex-post than ex-ante: this should reduce approval delays significantly. These hurdles explain why the necessary data is not available today in the economic literature and why a research project is necessary to investigate further the initial analysis.

What data is needed? As we detail in an article for Telos,[61] data required will include all the operational losses occurring between the restructuring decision and the departure of the employees, plus losses due to delays in rehiring employees with different skills, taking into account the (usually) declining sales and the (often) demotivated teams. The reallocation of resources from failed projects will also be negatively impacted by the time required for the completion of all legal and administrative procedures. Again, such losses can amount to much higher costs than the severance provisions themselves.

In France, the DGFiP[62] would have information about the restructuring provisions taken by a company. It remains to be seen whether we can isolate provisions related specifically to human capital, directly (e.g. severance or retraining costs) or indirectly (e.g. office rental allocation). At the European level, the CompNet database of the Competitiveness Research Network should also provide useful micro-data on companies, although nothing seems to pertain to restructuring costs. In the United States, global provisions are in the public domain for listed companies via the “10-K Form” required by the SEC. At a global level, the Orbis database of bureau van Dijk (now part of Moody’s), should be able to provide useful information, especially for large firms.

Once these operational costs are known, one key difficulty is to map layoffs with their related provisions. This is because, provisions pertaining to the same large layoff plan will typically be

[60] In greater detail in some countries than others: for instance, the SEC requirements in the US are fairly detailed (Form 10-K).
[61] (Coatanlem & Coste, 2024)
[62] Direction générale des finances publiques

reported over several quarters, especially in Europe. Also, we need a clear allocation of provision per geographic zone, which, as mentioned above, is rarely publicly available. These are two important area where companies would need to provide more information.

An important consideration is the normalization of data. To enable international comparisons (including within the same company), the research study should obtain granular data about:

- The number of employees made redundant per country for different categories of employees (ranges of salaries and/or job types),
- The average salary level per range of salary / job type and per country / region,
- The average salary level of the redundant teams per range of salary / job type.

At a minimum, categories of employees should allow us to split data between production (usually blue collars), R&D (usually engineers), sales & marketing (usually high salaries), General and Administrative (split between low salaries and managers with high salaries).

The objective of such data gathering is to compare the restructuring costs to the average compensation, therefore documenting homogeneously the cost of failure in terms of months of compensations.

Initially, in the interest of time, it may well be worth sending a detailed questionnaire to a list of 30 to 40 large companies exposed to restructuring in recent years. This could be done either by creating new surveys or by leveraging, and adding to, existing surveys such as those of the ZEW – Leibniz Centre for European Economic Research, the Banque de France or the European Central Bank.

Section 6 - POSSIBLE REFORMS IN EMPLOYMENT PROTECTION LAW AND OTHER AREAS

We have seen that Employment Protection Law, as well as Bankruptcy regimes, can hinder disruptive innovation when they sanction business failure too severely. Lowering the cost of failure would enable startup companies developing frontier technologies to scale to the level of world leaders and would provide large companies with the agility necessary to adapt to the volatility of the tech sector.

Confronted with lagging productivity and growth, European governments so far have been mostly inclined to subsidize start-ups directly or create tax advantages for investors. This is costly and ultimately ineffective, as long as the profitability of private investments in the tech sector is not there. Public support in the United States triggers 10 times more investments by private companies (leverage effect). The same public support has a much poorer impact on European companies.[63]

As summarized by the OECD, “a key challenge in designing EPL is how to favor productivity-enhancing reallocation, while minimizing the costs borne by firms and workers. In this regard, well-designed social safety nets and portable health and pension benefits are necessary to support

[63] (Coste, 2022)

transitions between jobs, while there is also a case for retraining and other active labor market policies."[64]

Moreover, "one concern is that the asymmetric liberalization of employment protection for temporary contracts while leaving in place stringent regulations on permanent contracts may undermine the accumulation of firm-specific human capital."[65] As shown by (Bassanini, Nunziata, & Venn, 2009), partial EPL reforms, facilitating the use of fixed-term and atypical contracts, are unlikely to have an important impact on efficiency and technological change and cannot therefore be a substitute for comprehensive EPL reforms whereby dismissal restrictions for open-ended contracts are also weakened.

In other words, even though in recent years many countries have chosen to ease regulations on temporary and atypical contracts to make their labor market more flexible, the pay-off in terms of productivity growth that can be expected from these reforms is very low."

Fortunately, solutions exist that do not threaten the European social model. We suggested in Commentaire that the Danish flexi-security model would be a good starting point.[66] Denmark has generous unemployment benefits but very easy and flexible layoff rules. We could transpose that model in other European countries but only for top earners. Basically, current EPLs would be abolished for salaries above a high threshold, for instance the top 5 or 10%.

The employees targeted by disruptive innovation large restructuring plans are typically highly qualified, highly paid and are rarely in periods of long unemployment. This would therefore present a win-win situation: no downside for most workers (especially on those exposed to mass unemployment like blue collars or less-qualified employees) and massive benefit for the agility of European companies and European competitiveness and prosperity. There is a strong rationale to make this new disposition applicable to all industries, and not just those at the technology frontier: apart from the fact it would make it legally more enforceable (it is very doubtful high courts would accept any discrimination on the basis of job classification by sector), it would also guarantee the agility of the entire ecosystem, including clients and suppliers. This is turn will facilitate the emergence of a vibrant domestic market that is currently missing in Europe.

One could argue that not all top earners are young flexible and mobile engineers capable of getting a new job anywhere: a significant proportion will in fact be in the category of senior employees near the end of their career. So, a transition plan would most likely be needed for those types of employees. And if the law cannot provide them with as much protection as before, private contracts could, via collective conventions, firm level agreements or even contractual work contract – like already exist in some countries like the United States.

One could also ask why Denmark, to the extent is has an optimal EPL from the perspective of innovation, is not yet a new Silicon Valley? Its high concentration of tech firms certainly makes it a top location for innovation activities. But the type of simplified EPL we propose is a necessary condition, not a sufficient one. Other aspects of the ecosystem have to be satisfied, in particular a dynamic research community, a highly trained workforce, scale, synergies with other industries, good

[64] (McGowan, Andrews, Criscuolo, & Nicoletti, 2015)
[65] Ibid.
[66] (Coatanlem & Coste, 2023)

energy mix, strength of the local markets, etc. The good news is that several key European regions satisfy those requirements. From a legal perspective, neither EU regulations nor bilateral agreements with the International Labor Organization would prevent an EU member to implement the type of EPL we propose.

An alternative approach is provided by the Severance Pay Reform introduced in Austria in 2003, where severance packages are no longer paid by the employer but by a worker individual capital accumulation account. That account receives contributions of 1.54% of payroll made by the employer.[67] Under certain conditions, the account can also make payments towards a retirement pension plan. While this system is likely to boost mobility and decrease severance costs (the World Bank estimates a 35% reduction in average), it only addresses part of the problems we raised around the duration of the restructuring process.

Sweden has also an interesting EPL framework, although not as efficient as in Denmark. There are no mandatory severance pay requirements, which facilitates restructuring, while at the same time a generous social welfare system provides effective safety nets, which allows laid off employees to retrain and get back on their feet. But notification of collective dismissals to the Swedish Public Employment Service is required by the Co-Determination Act of 1976, up to 6 months for layoffs involving more than 100 employees. Concurrently, employees receive a notice based on the duration of their employment: e.g. 3 months for employees with 4 to 6 years of employment, up to a minimum 6 months for employees with more than 10 years of employment.[68]

Consultation rounds are determined by firm specific collective bargaining agreements between the employer, the employees and relevant trade unions. Sweden also has a “last in, first out” rule that favors employees with the highest seniority of employment, but, according to (Von Below & Thoursie, 2010), Swedish employers have tools to circumvent it, so the rule doesn’t matter much in practice.

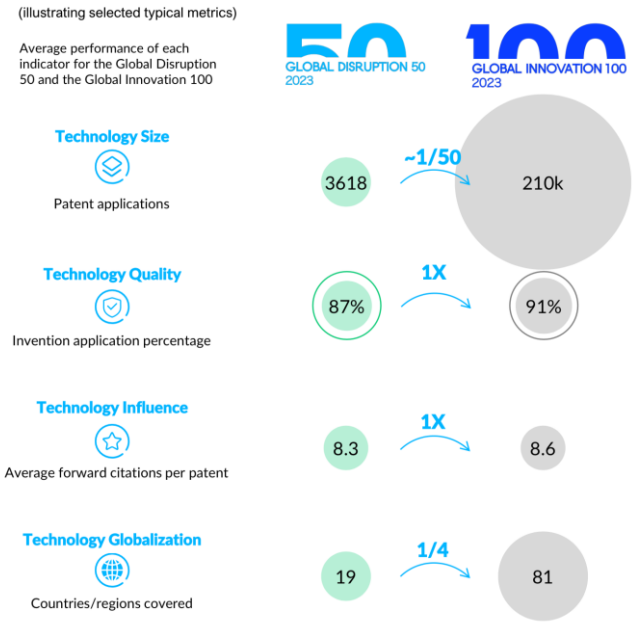
Outside the European Union, Switzerland provides an example of very flexible EPL, in fact ranked number 1 by IMD (just in front of Denmark),[69] and number 2 by the World Economic Forum (after Hong Kong).[70] It does not require employers to provide a reason or justify their action of employee termination. [71] The mandatory notice periods are relatively short: one month during the first year of employment, two months between the second and ninth year of employment, three months beyond nine years of employment. In most cases there is no mandatory severance pay.[72] This flexible system is combined with a generous social net and associated with a very low unemployment rate (2.0% in 2023).

Another consideration is to facilitate the emergence of “disruptors” that have the potential to become the next industry leaders. Indeed, the problem of scaling up companies has been a recurring theme in Europe. A recent study[73] has shown how relevant they are in today’s fast changing world, at the

[67] (World Bank, 2012)
[68] (Business Sweden, 2022)
[69] (IMD, 2024)
[70] (World Economic Forum, 2019)
[71] https://www.seco.admin.ch/seco/fr/home/Arbeit/Personenfreizugigkeit_Arbeitsbeziehungen/Arbeitsrecht/FAQ_zum_privaten_Arbeitsrecht/kuendigung.html
[72] Mandatory severance pay only applies to situations where the employee is over the age of 50 and has worked for the company for 20 years or more, and is limited to 8 months of salary.
[73] (Patsnap, 2023)

beginning of the digital, AI and robotic revolution. It compares the top 50 disruptors and the top 100 innovation leaders across several metrics. While the market leaders and their potential future replacements clearly differ in size, the quality and influence of their innovation is comparable, very interestingly, as show in the graph below:

Figure 8: Comparisons between top disruptors and top innovators



Source: Patsnap

Because traditional corporate limited liability prevents creditors from accessing founder's personal assets, creditors often ask founders of new risky companies to provide collateral in the form of their personal assets. A recent paper shows the importance of Personal Bankruptcy Law (PBL) on innovation, especially in the number of patents filed and their quality.[74] Using patent data and PBL reform information for 33 countries from 1990 to 2002, the authors find that "pro-debtor PBL reforms increase the number of patents filed, citations to those patents, and début patents by firms with no previous patents. These reforms also redistribute innovation across industries in closer alignment to its distribution in the U.S., which we take to approximate industry innovative potential. […] we also find pro-debtor PBL reforms increasing value-added growth rates across all industries, and by larger margins in industries with more innovation potential."

[74] (Cumming, Morck, Rong, & Zhang, 2024)

CONCLUSION

We have established that, because of sub-optimal EPLs, most European countries lack cost-effective and swift restructuring capabilities for companies, with the consequence that high-risk investments that are deemed profitable in the United States don't make the cut in Europe.

Industries at the technology frontier are unpredictable, disruptive, and volatile. With higher severance payments and, more importantly, longer delays and higher uncertainty in Europe, the total costs of adaptation are about 10 times higher than in the United States.

After decades of stronger agility, American companies have the financial means to invest in new technology frontier ventures, European companies simply can't compare. And what is happening today in tech is likely to apply tomorrow to all future disruptive innovations, from biotech to energy transitions.

Information technologies are powering the current industrial revolution, just like the steam engine did in the 19th century and the internal combustion engine in the 20th century. Europe's lag in tech compares to China's rejection of European technologies in the 19th century, which led it to the terrible "100 years of humiliation" and, by reaction, is driving today its appetite for tech dominance. For Europe's security, this cannot continue.

The ECB estimates that poorer investment in information technologies in the euro area has already led to a 20% productivity decline relative to the United States since 1995.[75] The political risks of inaction are far greater than those of the limited EPL reforms we suggest, especially in a world of "winners take most": staying out of the current industrial revolution would translate into lesser competitiveness for companies, less prosperity for households, less tax revenues, growing social unrest and loss of geopolitical relevance for governments.

[75] (Schnabel, 2024)

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More at https://fr.wikipedia.org/wiki/Yann_Coatanlem

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