# Innovation and R&D in Covid-19 recovery plans: The case of France, Germany and Italy

by A. Benramdane, S. Guillou, D. Harrich, and K. Yilmaz

Economies have been dramatically affected by the pandemic of Covid-19 in 2020 (OFCE, 2020). In response, several emergency measures have been undertaken by governments to support the people and the firms that were directly and strongly hit by the lockdowns. After the first shock in spring 2020, which had an international dimension, all economies experienced a decline in their production which jeopardizes their future and the wellbeing of their population. In the near future, bankruptcies and unemployment are expected to increase and the slowdown of private investment will minor both quantitatively and qualitatively the future capacities of production. Meanwhile, the huge rise in public debt will complicate the States' ability to invest and promote long term growth through public investment. To cope with this dismal future, in addition to emergency measures, many governments have implemented recovery plans to boost and support the economy and to sustain a return to previous levels of wealth. Some governments try, through the recovery measures, to orient their future growth toward specific objectives. In the EU, the Resilience Recovery Facility (RRF), which aims to finance part of EU members' plan, is adopting this stance by demanding that part of member's plan will include at least 20% of measures dedicated to digital improvement and 27% dedicated to green investment.

This post is focused on the technological dimension of recovery plans designed to face the downturn triggered by the Covid-19. By technological, we mean what is related to R&D, innovation and digital technology. Our concern is associated with the fact that R&D investment as well as technological enhancements are fundamental seeds of future growth. They are necessary to ensure sustained growth under the paradigm of globalized competition where education, technology, and intellectual property are the materials of future comparative advantages (Haskel and Westlake, 2017).

Our interest in the technological dimension of EU recovery plans is also bound to the duality of the COVID-19 shock regarding technology. Indeed the COVID-19 entailed both a negative and a positive digital shock.

Negative because the economic crisis will lead firms to cut into their R&D spending which will affect negatively the nature and the amount of capital. There is indeed a risk that the smallest investors will cut into their R&D expenditure as well as their digital investment because of the lack of cash and the rise in debt. But meanwhile, the lockdowns fostered the use and adoption of digital tools to work, to organize, to produce and to sell. There are some digital firms which are benefiting a lot from the constraints imposed to the economy by the sanitary measures. The huge rise in share price of firms from tech and e-commerce sectors relative to more traditional sectors witnessed the division

which is fracking economies. Given the leadership of those firms in world
R&D investment, the latter are likely to be sustained by them, but
traditional industries such as car, airplanes and smaller actors are likely to
disinvest by lack of cash and rise in uncertainty. Moreover, letting the
biggest ICT, digital and platform firms to drive the R&D will accentuate
their leadership and expansion and be detrimental to competition.

Crises
always divide unevenly the population of firms between winners/leaders and the losers/followers
by giving larger market shares to the leaders which usually enter crises with
larger financial means and other organizational buffers. But the nature of this
crisis exacerbates the effect and highlights the frontier between digital users
and producers and the rest of the firms. The only way to balance the superpower
of digital giants is to reinforce the digital dimension of the rest of the
economy. In addition, numerous studies established the existence of a digital
dividend which means that increasing the digital intensity of the economy is
helping to push growth (see for instance, Sorbe *et al.*, 2019).

The
direct political benefit of a digital orientation is weak, and the returns of
investment in technology are not immediate and will not push growth in the

short term. Hence, although governments might not be enticed with such orientation of their plans, they are expected to tackle the future needs for mastering digital technology. Recovery plans should account for the need for future growth to self-sustain and it explains the position of the EU.

This post aims to explain and evaluate the technological dimension of main members' recovery plans within the EU framework of the RRF.

It shows that the 20% share recommended by the EU is not fully respected by Members' plan. Germany is clearly the country which is allocating a higher weight to technology than other countries. Italy, while lagging behind in matter of R&D, productivity and digital indicators, is privileging emergencies expenses and France is mixing the two, pushing green technology.

**The EU stance in favor of digital**

In July 2020, the EU Council has agreed to create a €807 (or €750 in 2018 euros) billion Covid-19 recovery fund titled "Next Generation EU" in addition to the long-term budget of €1 211 billion.

The EU plan is mostly a framework with an amount of money to finance EU members' plan after request. It is less of a Keynesian stimulus style than of a long-term structural reform plan. The final form of the EU

plan was the result of the debates around the respective share of loans and subsidies and about the conditionalities to associate with the financing. Conditionality was hugely debated within the EU council.

The 2 pillars of the EU plan are digital and green orientations which should drive the investment projected by countries' plan.

The digital pillar is associated with the long promotion of R&D and innovation throughout EU policies, goal which was clearly established in the Lisbon Agenda of 2000. The latter had the ambition to make the EU, by 2010, « the most competitive and dynamic knowledge-based economy in the world ». This ambition was associated with the objective of R&D spending reaching a 3% share of GDP. While the weight put specifically on the digital enhancement is new, it is inspired by the EU's long-held belief in the power of technology to increase potential growth.

Regarding R&D the objectives have been matched only by Germany; Italy and France did not. The ratio of R&D spending to GDP reached a mere 1.43% for Italy in 2018. France performed slightly better than Italy by keeping this ratio at 2.19% percent in 2018, still below the target of 3%. Despite the failure to reach the Lisbon's goals, the EU has always

fostered R&D
policies with a generous financing budget and a very flexible monitoring of
State aids dedicated to encouraging research and innovation.

For
the last 10 years, China joined the United States as a source of challenging competitors
to EU companies. The EU is increasingly lagging behind concerning digital
activities from e-commerce, e-finance to cloud services. The need for
digitalization to help the economy and the SMEs cope with the new digital turn
of branches of the economy is motivating the EU digital policy. Regarding
digital indicators (OECD digital indicators), Italy is lagging behind in ICT
adoption, e-commerce or R&D intensity while France and Germany are very
close to each other.

Green
objectives came later in the EU policies but are more and more central and
invade all areas up to R&D for which an increasing part has to be dedicated
to the fight against climate change. The new EU commission (from May 2020
elections) presided by Ursula Von der Leyen has launched a green new deal and
planned to achieve carbon neutrality by 2050.

The
next multiannual long-term budget for 2021-2027 is
divided into 2 parts: the long-term budget (or the multiannual financial
framework) of €1 211 billion and the NGEU (Next Generation EU)

of €807 billion (in current euros). The Resilience Recovery Fund is part of the EU budget for the next 6 years. The RRF is taken from the NGEU and amounts to €724 billion.[1]

To benefit from the RRF, EU countries have to present a recovery plan with respect to the economic recommendations made by the EU Commission in the last semester.

Besides the RRF, the multiannual budget is distributed into 7 headings. In the previous multiannual budget, the Competitiveness heading (now named "Single market, Innovation and Digital, SID") – which includes the R&D funding Horizon 2020 – had 20% of the budget. In the next multiannual budget, the share of the whole budget dedicated to the heading SID – which includes innovation and R&D – has increased. As of the end of 2020, the budget for SID is €143.4 billion (MMF plus €5 billion from NGEU) of which Horizon Europe is €84.9 billion and Digital Europe Program is 6.761 billion.

On the green side, the budget is not under a single heading. Members committed themselves to spend 30% of the next budget to the fight against climate change. To match the 30%, financings are affected to the green objective weighted conditionally on their objective. A weight of 1 is affected to measures 100%

dedicated to climate concerns.

**Technological orientations of main EU members' plan**

Germany has been of great influence in the greening of EU policies. Angela Merkel, dubbed the "climate chancellor", definitely gave a green direction to the German economy, abandoning nuclear energy and investing a lot in green energies.

Meanwhile, the government was more recently concerned by technological challenges and Chinese competition which may threaten its leadership in manufacturing. Germany's Post-Covid Recovery Plan was set under the umbrella of the country's High-Tech Strategy 2025 (HTS 2025) which was decided in September 2018. The latter was aiming to increase the share of R&D spending to 3.5% of its GDP. The implementation of a research and development tax credit, imitating the French one, was an additional step in its alignment on other countries R&D support (see Guillou and Salies, 2020). In 2018, 3.13% of GDP, or €105 billion, was spent on R&D. COVID crisis aside, Germany has already committed to the ambitious goal of raising R&D Investment as a share of GDP to 3.5%, which will be an estimated €168 billion by 2025.[2]

The way Germany is hoping to achieve this goal is by revamping and overhauling its incentives on investment. Given that 70% of German R&D comes from private investments, the German state is trying to create a framework that provides private enterprises and individuals the freedom to innovate[3]. For example, the recently created Agency to Promote Break-Through Innovation will provide insurance to scientists and businesses who undertake cutting-edge disruptive innovation. Given the

inherent risk to R&D, this insurance is meant to guarantee that individuals worry less about the risk and focus more on achieving breakthrough results[4]. Similarly, SMEs typically do not undertake R&D given the expenses associated and the difficulty in capturing the returns on investments. This is why the German government launched its Transfer Initiative Program, that will help SMEs turn the fruits of their research into tangible marketable products, while also providing businesses with less than 100 employees grants that cover up to 50% of their incurred R&D costs.[5]

France has dedicated large sums to support its firms' R&D with the most generous support among OECD countries. France praises itself with maintaining a high level of public investment in R&D, notably when it comes to the energy sector. In 2019, spending dedicated to the energy sector (€1163M) progressed by 5% compared to 2018, mostly focusing on nuclear energy (€732M) and renewables (€324M). The share dedicated to fossil energy has now fallen to represent only 1% of total R&D financing. Among G7 countries, only Japan spends more as a percentage of GDP when it comes to public spending dedicated to R&D in the energy sector.

R&D spending in the green sector in France is also a priority of the *France Relance* recovery plan. Out of the €30 billion dedicated to ecology, approximately 6.5 billion euros are planned to be dedicated to R&D in green technologies and the

decarbonation of multiple industries (see details in the attached table). The Fiscal Monitor of the IMF released in October showed that France was the country within G20 with the highest share relative to GDP of its plan dedicate to climate issues (IMF, 2020, page 24).

While ecology is a major concern of the recovery plan, the energy transition towards renewable energy has been a goal since the Paris Accord. In 2019, the Parliament had adopted the law “Loi Energie-Climat” to aim at achieving carbon neutrality by 2050, in line with the European Union. Yet, the Commission for Economic Affairs announced on November 12, 2020 that the budget for 2021, including the recovery plan France Relance, will be insufficient to achieve this goal.

In Italy the recovery plan was decided in a tough political context and very narrow budgetary marge de manœuvre. The Italian Prime Minister Giuseppe Conte seized the EU funding as “an opportunity to build a better Italy” by promising the nation that no single cent will go in waste. This promise comes in the wake of a lingering economical recession as Italy was one of the most affected EU countries by the Great Recession of 2008 and the Sovereign Debt Crisis of 2011.

In a calculated move to add more seats to his coalition, the Prime Minister Conte

has resigned on 26 January upon disputes with the opposition on the use of the EU funds to fight against the coronavirus crisis. His promise of “building a better Italy” in June 2020 is at stake upon this new decision that caused yet another political instability in the country.

Since 1995, the country maintained its government debt to GDP ratio over 100%, contrary to the 60% level set by the Maastricht criteria. Moreover, the country was strikingly hit by the Great Recession. Italy’s GDP shrunk by 5.28% in 2009, and in fact the average annual real growth per capita between 1999-2016 was 0 percent. Moreover, unemployment soared to 1970-80 levels of 12.7% in 2014. Overall, these crises have aggravated the social, territorial, and gender inequalities, and also resulted in an outflow of skilled young workforce. Many of these weaknesses are tied to technological and educational gaps. For instance, Italy’s R&D spending in 2017 stayed at 1.33% of the GDP compared to the EU average of 1.96 %, 2.22% for France and 2.93% for Germany (source OCDE). Italy’s annual GDP growth of 0.343% in 2019 has also underperformed below the EU average of 1.554% in the same year. Antonin *et al.* (2019) underlined that Italy was trapped into a repetitive slowdown for structural reasons such as the North-South dualism, the small size of companies and a large share in low-tech sectors, which all affect negatively its productivity growth.

**Digital dimension of Recovery plans**

Most countries implemented measures to face the economic urgencies. Then, given how strong their economies were affected, they had to implement recovery measures and submit plans to the EU in order to benefit from the RRF subsidies and loans.

In Table 1, we list the amount of the total recovery plan per country and the part that is dedicated to « technology, innovation and R&D » investment (Tech. part). We list the « tech » characteristics of this part which may differ by country and last, we give the period during which the amount is expected to be spent. Green investment could also include R&D investment. We tried to retrieve the R&D content of policies which primary aim is not R&D.

Table. **Amount of the recovery plans and the technological part in billion euros**

| Countries | Recovery plan | Technology amount and share | Period of spendings |
|---|---|---|---|
| EU | 724 | 144.8 (20%) | 5 years |
| France | 100 | 14.4 (14.4%) | 5 years |
| Germany | 130 | 50 (38%) | 5 years |
| Italy | 454 | 51.2 (11.3%) | 14 years |

*Source:* Author's computation on the base of legal documents. The EU tech part is coming directly from the EU legal text (EU council, 2020).

Germany passed its Konjunkturpaket (known commonly as the « Wumms » Recovery Plan) on the night between June 3rd and June 4th.[6] The €130 billion project (or 3.8% of German GDP)

covers three main sectors of the economy, and by and large is centered around the consumer.[7] Many elements of the Wumms plan are dedicated to increasing consumer confidence, boosting consumption, and raising aggregate demand. As such:

- €32.5 billion are going to directly benefits consumers and households in two main ways. Firstly, households will benefit from a child bonus (EUR300 per child), totaling an estimated €5 billion. In addition, all German consumers will benefit from the €27.5 billion VAT cut that will lower VAT rates from 19% to 16%.[8] This measure will come into effect in the second half of 2020;
- €25 billion is earmarked for the worst impacted sectors – hotels, restaurants, bars, and clubs – that were forced to close from June to August. Moreover, these corporations are set to benefit from corporate tax relief valued at €13 billion;
- Finally, €50 billion is being spent on preparing Germany for the future, particularly taking the shape of incentives to increase R&D investments in cutting edge green components. Once again, the consumer is central as the plan includes grants to increase the affordability of Electrical Vehicles to the average German. The Deutsche Bahn will be given €5 billion in equity to allow for the modernization and electrification of its rail network, while the fleet of buses in Germany's public transportation grid will be upgraded to more sustainable models. Municipalities and public institutions are being given €10 billion to help fast-track the modernization of public transport infrastructure.[9]

The
German government has specified a share of €50 billion towards R&D and

Green transition efforts in their Wumms package. While the R&D-share of total recovery is high, it must be remembered that Germany already has a complementary R&D Strategy (High-Tech Strategy 2025) previously presented.

Called "France Relance", the French plan ambitions to revert back in 2022 to levels of growth and economic activity similar to those achieved prior to the crisis. It was initially announced by President Emmanuel Macron on July 14th, and later officially presented on September 3rd by prime minister Jean Castex. It is part of the total state budget, exposed in the "Projet Loi de Finance 2021" and amounts to 100 billion euros spread over 5 years, until 2025. The plan has three main targets, and the 100 billion euros are distributed accordingly:

- €30 billion for the environmental transition
- €35 billion for competitiveness and innovation
- €36 billion for social cohesion

The first and second items have R&D targets and the second has a specific objective of digitalization.

The digital share is coming from the sum of R&D-oriented & green measures

included in all three parts of Plan France Relance, which is also included in the Program for Investments of the Future (Programme d'Investissements d'Avenir, PIA). Indeed, in parallel to the French "plan de relance", France has announced a fourth Program for Investments of the Future (PIA) that will serve to finance a major part of the digital and green innovation and research components of the plan France Relance.

Out of the 20 billion euros of the PIA, 11 billion euros are specifically dedicated to the France Relance plan over five years. This amount is divided into four categories of spending:

- Green technology and innovation: 3.4 billion euros dedicated to the development of green technologies and sectors, specifically when it comes to green hydrogen, recycling, biotechnologies, green transition of industries, and improving the resilience of cities to climate and health risks.
- Economic resilience and sovereignty: 2.6 billion euros dedicated to support the development of key digital industries (cybersecurity, cloud, digital health system, bioproduction of innovative therapies…)
- Support ecosystems of research, innovation, and higher education: 2.55 Billion euros
- Supporting businesses engaged in innovative industries: 1.95 billion euros dedicated to

finance and cover the financial risks inherent to their R&D plans in order to support further bold innovative projects.

In addition to the PIA, complementary measures include: decarbonation of key industries (aeronautic, automobile, railway…) (1.2 bn); the development of green hydrogen (2 bn); preserving jobs in the R&D sectors (0.3 bn); Strengthening the resources of the National Research Agency (ANR) (0.4 bn). The sum amounts to €14.4 billion. These ambitious goals have to tackle companies' own trajectories which may be in contradiction in the short run, such as the recent decision of Sanofi to eliminate 364 positions

Italy has presented the **National Recovery and Resilience Plan (*Piano nazionale di resilienza e rilancio*)** on 15 September to commit to the condition from the EU to submit a draft proposal for the use of COVID-19 funds. The final draft is to be decided by January 2021.

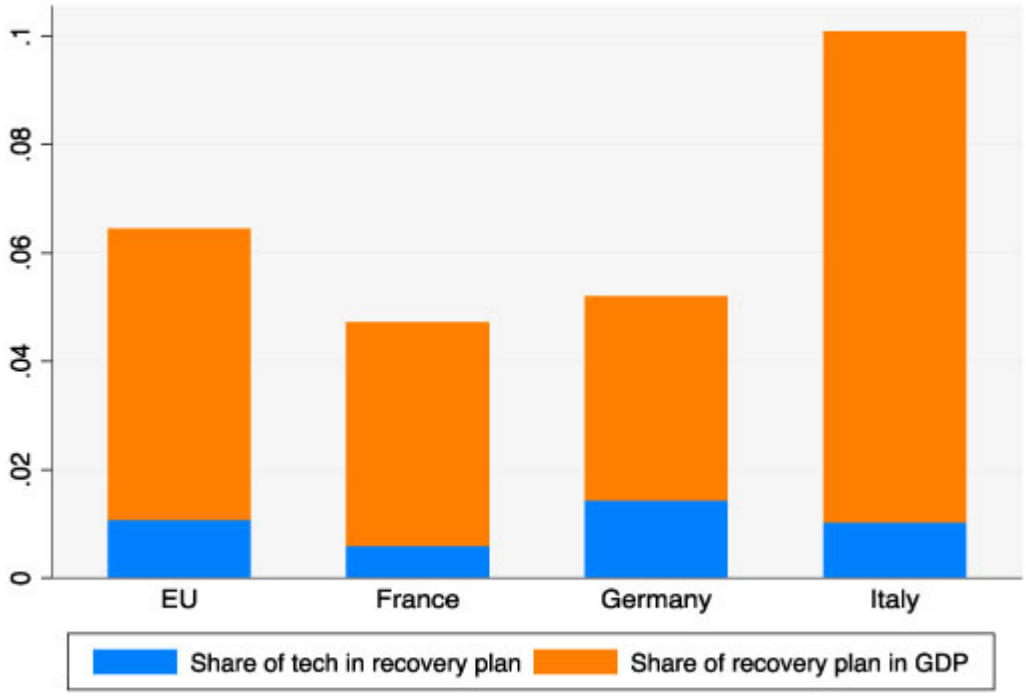
Three strategic lines for recovery:

- Modernization of the country: efficient, digitized, and with less red-tape public administration that truly serves the people, creating an environment suitable for innovation, promote research, and increase productivity and quality of life;

- Ecological transition: decreasing greenhouse gas emissions in accordance with the EU Green Deal, increase the energy efficiency of production chains and transition to produce environmentally friendly materials, reforestation, and investment in sustainable agriculture;
- Social and territorial inclusion, equality of gender: reducing inequalities, poverty, and gaps in access to education and public services especially in the South, strengthening the health system, improving the inclusion of women in all areas of workforce and administration.

The amount and specific measures are not yet been displayed with details. Regarding Italy, of the €51.2 billion that the government has allocated for digital investments, €2.5 bn are allocated for “Digital & Green Skills.” However, the Italian plan has a separate “green” segment where 62.4 billion euros are allocated.

Graph. Share in GDP of countries' plan of which the technological part




Note: Computation by the authors. Data for Italy were normalized to match the 5 years of other plans.

**Conclusion**

The
R&D has long been a priority in the agenda of the EU, and the only
industrial policy that was unlimited. Obstacles in achieving the Lisbon Agenda,
dated from 2000, have been diluted into institutional and economic problems but
R&D and technology have relentlessly been flagship policies put forward by
the EU commission. More recently the green objectives and the carbon neutrality
have gained momentum and R&D financing is more and more in association with
environmental innovation. This is for instance the case in the battery project.
Nevertheless, the technological dimension of EU policies is oriented toward the
digital dividend in accordance with the new commissioner

Thierry Breton in
charge of the “Single Market, Innovation and Digital” heading. Coherently the
EU is pushing members to invest in the digital dimension of their economy. But
we observed that the members are not as ambitious as the EU would expect in
this respect. Germany is one of the few members to commit to engage massive
investment in digitalization, but it is in coherence with pre-COVID commitments
the country took. The EU RRF orientations are yet insufficient to trigger
digital convergence.

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[1] In turn the RRF is divided into subsidies (52%) and loans (48%). The RRF billions are to be spent between 2020 and 2023. Seventy percent of the RRF subsidies will be allowed to EU members before 2022 with respect to 2019 population, gross domestic income per head and unemployment rate. The thirty percent left

will be allocated to EU members in 2023 conditional on the crisis impact on the
member's economy.

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# Germany on the slippery slope of the research tax credit

by Evens Salies and Sarah Guillou

After years of hesitation, the German parliament has just introduced a tax scheme to promote investment in R&D. The decision precedes the Covid-19 crisis, but it may well be heaven-sent for German business.

What factors motivated Germany to take such a decision, four decades after the United States and France, when it is among the world's leading investors, in terms of both R&D and innovation? Is this yet another instrument to boost its competitiveness? And what will be the repercussions on R&D spending in France?

The German tax incentive, which came into force in January 2020, offers companies a tax credit equal to 25% of the declared R&D expenditure. The base is narrower than for France's research tax credit (CIR), since in Germany only wages are taken into account (including employer social security contributions).[1] The 25% rate is, however, close to the French rate (30%). A company's eligible expenses are capped at two million euros; and the tax credit for each firm will be limited to 500,000 euros

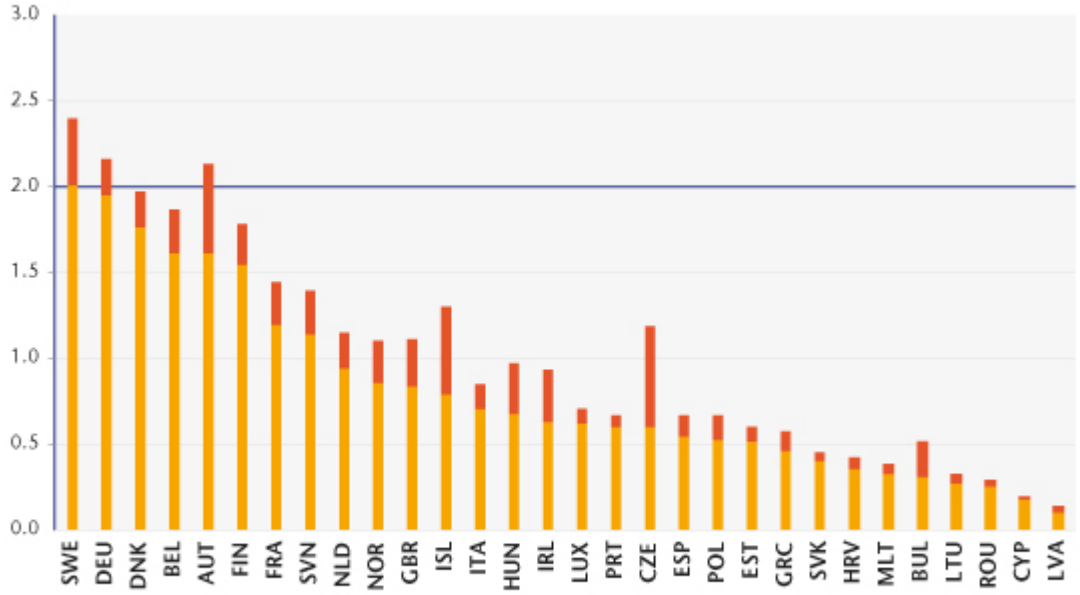
(subcontracting is subject to slightly different treatment). When a group has several subsidiaries benefiting from the system, as part of a joint research programme, the total eligible expenses are capped at 15 million euros (for a tax credit of 3.75 million).

By way of comparison, among French companies who carry out R&D, SMEs receive an average of 131,000 euros for the CIR credit, mid-caps [fewer than 5,000 employees] 742,000 euros, and large corporations 5.6 million, according to the MESRI's figures. The highest amounts exceed 30 million euros (with few companies in this category), but do not go much higher, because the CIR rate falls from 30% to 5% of eligible R&D expenditure beyond the base threshold of 100 million euros. Estimates of the annual loss in taxation for Germany (before taking into account the macroeconomic effects) could amount to as much as five billion euros. This is 80% of the French CIR credit, and on the same level as the R&D tax incentives in the United Kingdom. Without the cap, the scheme would cost the German federal government around 9 billion euros.[2]

The characteristics of the scheme and the high level of German private R&D raise questions about the Parliament's real motivations. Indeed, one could wonder why it did

not opt for an “incremental” system, that is, base itself on the increase in
eligible R&D expenditure, as in the United States, or in France until 2003.
Admittedly, an incremental system would not support firms whose R&D is stagnating
or falling (in which case direct aid is more effective), but it avoids the
windfall effects of France’s CIR credit (Salies, 2017).
The cap limits, but does not eliminate, these effects.

Figure 1. R&D effort (% of GDP), EU-28 and Iceland, Norway, 2018




*Note :* The lower rectangle is the R&D effort, after having excluded direct aid. The upper rectangle only includes direct aid.
The values are for 2018 or the nearest year.
*Sources :* EU open data portal.

The level of private
R&D spending is significantly higher in Germany than in any other EU Member
State (62.2 billion euros, excluding direct grants). France is far behind (27.5
billion euros), followed by Italy and Sweden (respectively 12.8 and 9.6
billion). A comparable ranking is obtained, for Germany, France and Italy, if
we measure the R&D effort (expenditure relative to GDP; Figure 1).

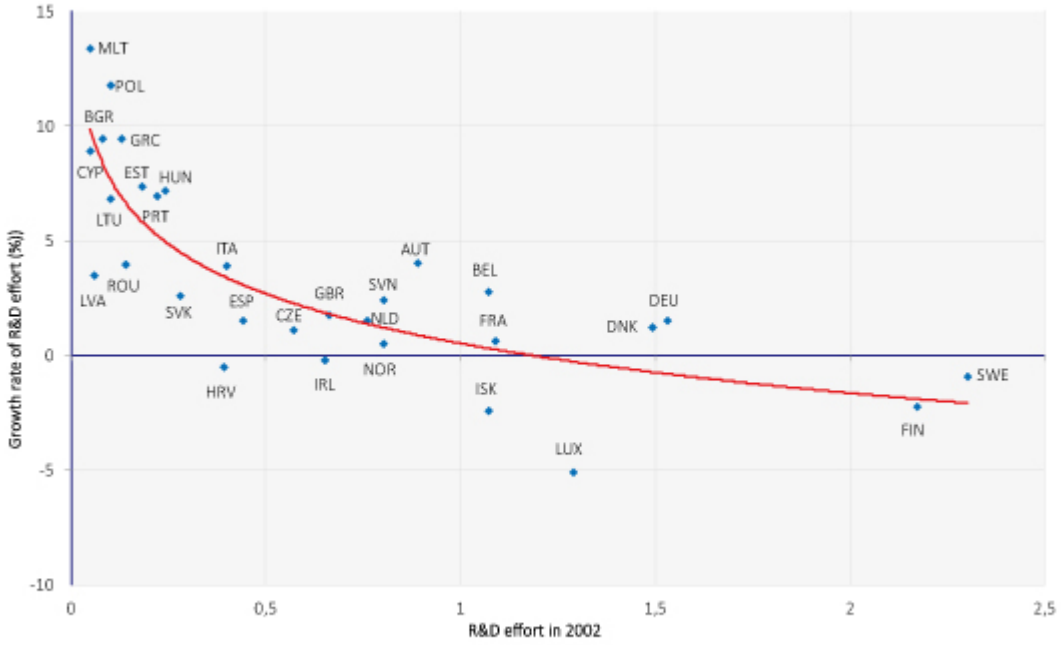
Germany is at almost the same level as Sweden (resp. 1.92 and 2.01 points).
Next come Denmark, Belgium, Austria and Finland. France is in 7th position with
1.44 points and Italy 13th with 0.71 point. Private research in Germany (excluding
subsidies) is only 0.08 GDP points below the 2% threshold set at the Barcelona
European Council in 2002 (the "Lisbon strategy"), which Sweden alone has
achieved. If subsidies are included, the private sector exceeds this threshold.
Since 2017, Germany's domestic expenditure on R&D (private and public) has
also exceeded the 3% threshold. The argument advanced in 2009 by Spengel and Grittmann from ZEW that a tax incentive would allow German companies
to overcome private underinvestment in R&D is therefore not convincing, at
least from a European perspective.

At the global level,
three countries are of course doing better than Germany: the United States,
China and Japan, where the private sector spends 1.6 euros for every euro spent
by Germany. However, if the motivation of Germany's Parliament for introducing
a tax incentive was to catch up with these countries, it would not have done so
only 40 years after the United States!

The introduction of a
tax incentive for R&D is less surprising if we consider changes in the
R&D effort. We have calculated the average growth rate of the R&D

effort for the 27 current Member States plus the United Kingdom, Norway and
Iceland over the period 2002-2017 (Figure 2).

**Figure 2. Rate of change in the R&D effort (%) versus effort, in 2002, EU-28 and Iceland, Norway, 2002-2017**




*Note :* The R&D activities are net of direct aid. For certain countries, the starting year is 2003, due to the availability of data. The concluding year is 2017, except for the UK (2016).
*Sources :* EU open data portal.

The curve through the
cloud (logarithmic adjustment) reveals an almost inverse relationship between
the rate and the effort in 2002, suggesting a convergence of R&D efforts.
Obviously, many countries are in a period of catch-up with respect to investing
in research. Most of them are small, but the whole is significant. For example,
in 2017 countries where the R&D effort grew at a rate at least equal to Germany’s
(1.52%) spent 82.8 billion euros (subsidies included), or 1.2 times Germany’s
expenditure (68.7 billion).[3] The R&D effort of these countries amounted to
0.8 point of GDP in 2017.[4]

Could the German CIR credit

thus be a response to the slowdown in the country's spending on R&D?
R&D expenditure behaves like other capital expenditure, i.e. it slows as the level rises. Furthermore, the more countries have a high level of domestic spending on R&D, the more they invest in R&D abroad. This results from the fact that R&D expenditure is mainly by large corporations and multinationals; we could cite, for example, Alphabet, Volkswagen and Sanofi, which in 2019 spent, respectively, 18.3 billion, 13.6 billion and 5.9 billion euros on R&D according to figures from the EU Industrial R&D Scoreboard. It is notable that the big multinationals open R&D centres abroad to get closer to their export markets, as well as for the bargaining power that these investments provide vis-à-vis local governments (see the report by UNCTAD WIR, 2005). All the major pharmaceutical firms (Pfizer, GlaxoSmithKline, AstraZeneca, Sanofi-Aventis, Novartis, Eli Lilly) have established clinical research laboratories in India. Even France's power supply firm EDF has an R&D centre in Beijing, dedicated to networks, renewable energies and the sustainable city. While this does not necessarily amount to substitution with domestic R&D, it does indicate that there is a kind of plateau in a given country for a company's R&D expenditure. The German measure is probably motivated by global competition to attract new R&D centres. This

is also the stated objective of France's CIR credit.

Does the enactment of a "German CIR" credit in favour of R&D bode well for France's competitiveness? Germany has a comparative advantage in the manufacturing sector, which invests heavily in R&D. The new German tax scheme will reinforce this advantage, without any risk of European litigation, since R&D support falls under the exemptions to the European Commission's control system on state aid. France's comparative advantage tends to be situated in services. France's R&D effort in services is more intense than in Germany: 0.28% of GDP in Germany and 0.67% in France. However, France stands out for providing less public support for R&D investment by service companies. In 2015, public funding's share of private research in services was 4% in France, compared to 11% in Germany, according to an INSEE study. The "German CIR" will only increase the relative price of French private research in services in comparison with German research. However, the R&D content of services determines the price, since it determines their technological content. The German tax advantage will therefore accentuate the cost advantage of the technological services which are themselves incorporated into manufacturing value added. So this will in turn increase the cost advantage of German manufacturers.

In addition, the price of R&D is increasingly determined by personnel costs, whose share in R&D has tended to rise in Italy and France and slightly too in Germany. This share was roughly equal in the latter two countries in 2017: 61.8% in Germany, and 59.7% in France.[5] Relative changes in researchers' salaries will have an impact on the difference in the amount of the tax credit between France and Germany. As noted, the new scheme introduced across the Rhine is based only on the costs of personnel. It could thus be conceptualized as a credit like France's Competitiveness and Employment Tax Credit (CICE) targeted at high-skilled workers in the research sector (referring to the CICE credit before it transforms into a reduction in employer social security contributions).

This is the reason why we think that Germany has rather wanted to pursue its policy of lowering corporate taxes. This was one of the motivations for France's CIR reform in 2008, which "[can] be viewed as [fiscal] compensation for lower corporate tax rates in other countries" (Lentile and Mairesse, 2009). The median tax rate in the OECD applied to large corporations has fallen continuously since 1995 (13 points over the period 1995-2018), from 35% to 22%. However, the German rate, which has fluctuated between 29 and 30% since 2008, is close to the French rate (around 32% in 2020; EC, 2020). The opposition that could exist in the realm of "tax

philosophy”,
between a French system based on a high rate and numerous provisions for
exemptions, and a German system based on a broad base and low rates, is not as strong
now that Germany has set up its own “CIR” credit.

This new incentive is
expected to enhance Germany’s attractiveness for R&D activities, which has
deteriorated somewhat (EY, 2020;
see also CNEPI, 2019).
Since 2011, the top three countries welcoming the most R&D centre projects were
the United Kingdom, followed by Germany and France. Since 2018, France has
hosted more projects than Germany (1197 against 971 in 2019), relegating
Germany to third place (this had already transpired in 2009, during the
financial crisis). The new tax credit should influence the trade-off of foreign
companies that are hesitating between France and Germany about where to set up.
It should also attract French companies to Germany, in the same way that a
significant share of private R&D activities carried out in France come from
foreign companies: 21% in 2015, for the percentage of expenditure as well as
the percentage of employed researchers (see Salies, 2020).
In accordance with European law, French companies established across the Rhine,
and liable for the “Körperschaftsteuer” (German corporate tax),
should be able to benefit from this niche.

Finally, private and public R&D entities located in France should be able to benefit from the tax incentive introduced in Germany, via subcontracting. But this will be only of marginal benefit, for two reasons: the tradition of the German "Mittelstand" has a culture favouring local networks, and the base for outsourced activities is capped (as with France's CIR credit). French subcontractors will probably be able to benefit from authorizations, in the same way as France's research ministry, the MESRI, issues authorizations in Germany. Since 2009, Germany has recovered 6% of the subcontracting approvals granted by the MESRI, the United Kingdom 4%, etc. The majority of authorizations are granted to companies located in France (75%).

Whatever the reasons that motivated the German Parliament to introduce a tax incentive in favour of R&D expenditure, it is certain that France has no interest in retiring its own scheme. This does not mean France shouldn't reform the CIR credit, as the leverage effects are not as strong as expected; aid (direct and indirect), in GDP points, has increased on average by 5.7% per year since 2000, whereas R&D, also in GDP points, has increased only by 0.73% per year. The weak leverage effect may have been *the* factor that for a long time discouraged Germany from introducing a tax break to boost R&D.

In this period of searching for ways to support business, it goes without saying that the research tax credit will remain unchanged in France and could see the base for the scheme expanded in Germany (in particular to help car manufacturers who have been refused a plan for direct support).

It is nonetheless regrettable that one of the reasons for Germany's new scheme is probably to be found in the inability of the Member States to advance the European Common Corporate Consolidated Tax Base (CCCTB) directive, which provides for harmonized R&D taxation for large firms by deducting R&D expenditure from the tax base on corporate profits. The German CIR may well be in competition with the French CIR, leading to transfers of R&D (by multinationals) from one State to another. The net increase in R&D spending by European companies remains to be estimated. Unless this spending increases, German policy could be viewed as yet one more uncooperative tax policy coming at a time when Europe is looking for common tax revenue.

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[1]. The French CIR credit includes, in addition to personnel costs, costs for the acquisition of patents, standardization, allocations relating to the depreciation of buildings used for research, etc.

[2]. Based on a private R&D expenditure of 62 billion euros in 2017 (direct aid excluded), we find 0.25 (the rate of the tax credit), 0.6 (the share of salaries in R&D), yielding a credit of 9.3 billion euros.

[3]. The Netherlands, the United Kingdom, Slovenia, Slovakia, Belgium, Latvia, Italy, Romania, Austria, Lithuania, Portugal, Hungary, Estonia, Cyprus, Greece, Bulgaria, Poland and Malta.

[4]. The GDP of these countries (at market prices in 2017) is 2.5 times that of Germany.

[5] The increase in France and in Italy was +7 and +20 points respectively over the period 2000-2017.

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# L'Allemagne prise dans l'engrenage du CIR

Evens Salies et Sarah Guillou

Après des années d'hésitation, le Parlement allemand vient d'introduire un dispositif fiscal en faveur des dépenses de R&D. La décision précède la crise déclenchée par la Covid-19, mais elle pourrait bien être providentielle pour les entreprises allemandes.

Quelles sont les raisons qui ont poussé l'Allemagne à prendre une

telle décision, quatre décennies après les États-Unis et la France, et alors qu'elle figure parmi les investisseurs de tête, tant en termes de R&D que d'innovations ? S'agit-il d'un instrument supplémentaire au service de la compétitivité ? Et quelles seront les répercussions sur l'investissement en R&D en France ?

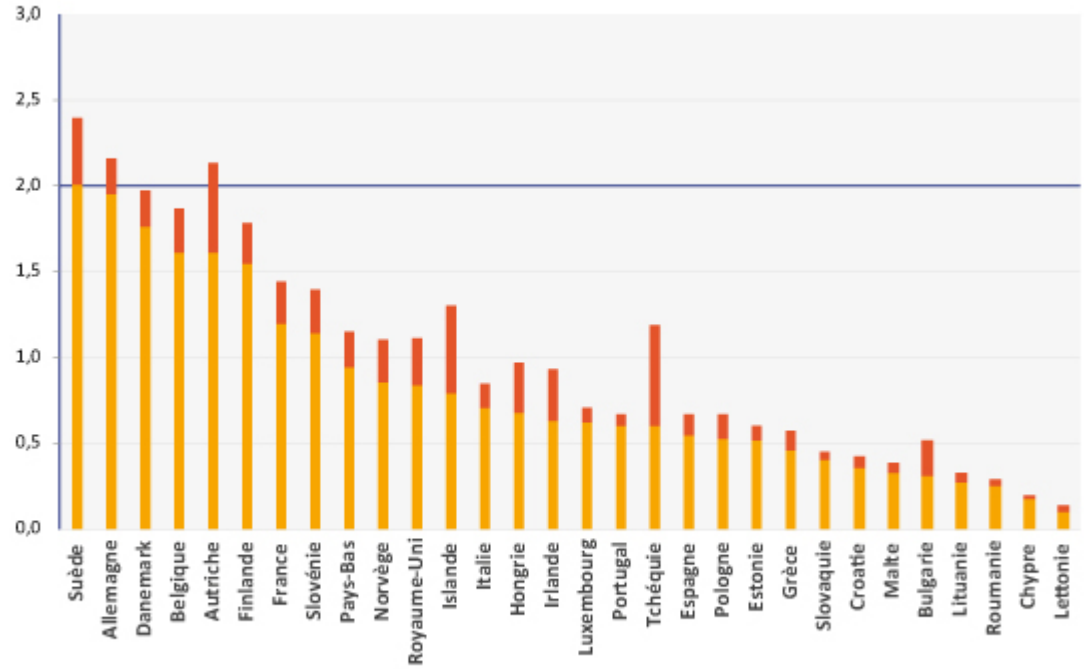
Le dispositif fiscal allemand, entré en vigueur dès janvier 2020, offre aux entreprises un crédit d'impôt égal à 25 % des dépenses de R&D déclarées. L'assiette est plus étroite que pour le crédit d'impôt recherche (CIR), dans la mesure où, en Allemagne, seuls les salaires sont pris en compte (cotisations patronales incluses).[1] Le taux de 25 % est toutefois proche du taux français (30 %). Les dépenses éligibles par entreprise sont plafonnées à deux millions d'euros ; le crédit d'impôt par entreprise sera limité à 500 000 euros (la sous-traitance a un traitement un peu différent). Lorsque plusieurs filiales d'un groupe bénéficient du dispositif, dans le cadre d'un programme de recherche commun, la somme des dépenses éligibles est plafonnée à 15 millions d'euros (crédit d'impôt de 3,75 millions).

À titre de comparaison, parmi les entreprises françaises qui font de la R&D, les PME reçoivent *en moyenne* 131 000 euros de CIR, les ETI,

742 000
euros, et les grandes entreprises 5,6 millions d'après les chiffres du MESRI.
Les montants les plus élevés dépassent 30 millions d'euros (peu d'entreprises sont
dans ce cas), mais ne vont guère au-delà, car le taux du CIR passe de 30 à 5 %
des dépenses de R&D éligibles au-delà du seuil de 100 millions d'euros
d'assiette. Les estimations du manque à gagner fiscal annuel pour l'Allemagne (avant
bouclage macroéconomique) vont jusqu'à cinq milliards d'euros par an. C'est 80
% du CIR français et autant que les incitations fiscales en faveur de la
R&D au Royaume-Uni. Sans le plafond, le dispositif pourrait coûter autour
de 9 milliards d'euros à l'État fédéral allemand.[2]

Les
caractéristiques du dispositif et le niveau élevé de la R&D privée allemande
interrogent sur les réelles motivations du Parlement. En effet, on peut se
demander pourquoi n'a-t-il pas opté pour un dispositif
« incrémental », c'est-à-dire assis sur l'accroissement des dépenses
de R&D éligibles, comme aux États-Unis, ou en France jusqu'en 2003. Certes,
un dispositif incrémental ne soutient pas les entreprises dont la R&D
stagne, ou baisse (les aides directes sont plus efficaces dans ce cas), mais il
évite les effets d'aubaine du CIR (Salies, 2017).
Le plafond limite ces effets, mais ne les supprime pas.

Graphique 1. Effort de R&D (en % du PIB), UE-28, Islande, Norvège, 2018




*Lecture du graphique :* le rectangle inférieur est l'effort de R&D, après avoir exclu les aides directes. Le rectangle supérieur n'inclut que les aides directes.
*Note :* les valeurs sont pour 2018 ou l'année la plus proche.
*Sources :* portail des données ouvertes de l'UE.

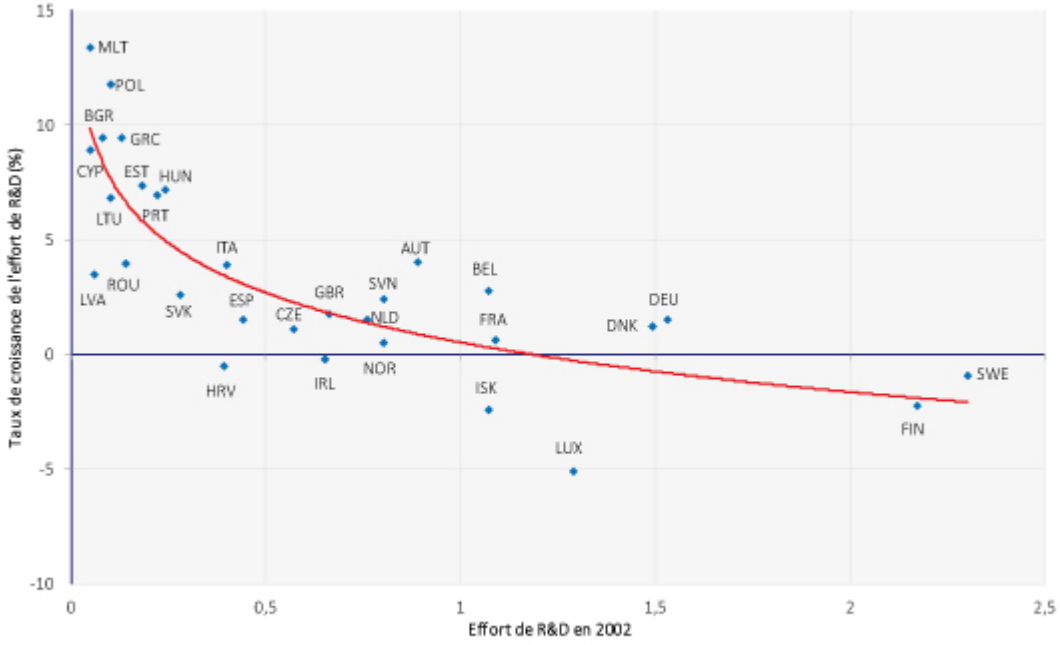
Le niveau des dépenses privées de R&D est nettement plus élevé en Allemagne que dans n'importe quel État membre (62,2 milliards d'euros, hors subventions directes). La France est loin derrière (27,5 milliards d'euros), suivie de l'Italie et la Suède (respectivement 12,8 et 9,6 milliards). Nous obtenons un classement comparable, pour l'Allemagne, la France et l'Italie, si on mesure l'effort de R&D (les dépenses rapportées au PIB ; graphique 1). L'Allemagne est quasiment au même niveau que la Suède (resp. 1,92 et 2,01 points). Viennent ensuite le Danemark, la Belgique, l'Autriche, la Finlande. La France est en 7e position avec 1,44 points et l'Italie 13e avec 0,71 point. La recherche privée allemande (hors subventions) n'est qu'a 0,08 point de PIB du seuil de 2 % fixé lors du conseil européen de Barcelone en 2002 (la « stratégie de Lisbonne »), que seule la Suède atteint. Subventions incluses, le secteur privé dépasse ce seuil. Depuis 2017, la dépense intérieure (privée et publique) de recherche de l'Allemagne dépasse également le seuil de 3 %. Ainsi, l'argument de Spengel et Grittmann du ZEW en 2009 qu'une incitation fiscale permettrait aux entreprises allemandes de surmonter un sous-

investissement privé en R&D n’est pas convaincant, du moins dans une perspective européenne.

Certes,
au niveau mondial, trois pays font mieux que l’Allemagne : les États-Unis,
la Chine, et le Japon où le secteur privé dépense 1,6 euro quand l’Allemagne en
dépense 1. Néanmoins, si la motivation du Parlement allemand à introduire une
incitation fiscale était de rattraper ces pays, il ne l’aurait pas fait 40 ans
après les États-Unis !

L’introduction d’une incitation fiscale à la R&D est moins étonnante si l’on considère l’évolution de l’effort. Nous avons calculé le taux moyen de croissance de l’effort de R&D pour les 27 États membres actuels, le Royaume-Uni, la Norvège et l’Islande sur la période 2002-2017 (graphique 2).

**Graphique 2. Taux de variation de l’effort de R&D (%) vs effort en 2002, UE-28, Islande, Norvège, 2002-2017**




*Note :* les activités de R&D sont nettes des aides directes. Pour certains pays, l’année de départ est 2003, compte tenu des données disponibles. L’année d’arrivée est 2017, sauf pour le Royaume-Uni (2016).
*Sources :* portail des données ouvertes de l’UE.

La
courbe traversant le nuage (ajustement logarithmique) révèle

une relation quasi-inverse entre ce taux et l'effort en 2002, suggérant une convergence des efforts de R&D. Visiblement, de nombreux pays sont dans une période de rattrapage en matière d'investissement dans la recherche. La plupart d'entre eux sont de petite taille, mais l'ensemble est signifiant. Par exemple, les pays dont le taux de croissance de l'effort de R&D est au moins égal au taux allemand (1,52 %), dépensent 82,8 milliards (subventions incluses) en 2017, soit 1,2 fois la dépense allemande (68,7 milliards).[3] L'effort de R&D de ces pays est égal à 0,8 point de PIB en 2017.[4]

Le CIR allemand serait-il alors une réponse au ralentissement de la dépense en R&D ? Les dépenses en R&D se comportent comme les autres dépenses en capital, elles ralentissent avec le niveau. En outre, plus les pays ont une dépense intérieure en R&D élevée, plus ils investissent en R&D à l'étranger. Cela résulte de ce que la dépense en R&D est principalement le fait des grandes entreprises et des multinationales ; citons par exemple Alphabet, Volkswagen et Sanofi avec respectivement 18,3, 13,6 et 5,9 milliards d'euros de dépenses de R&D en 2019 d'après les chiffres du EU Industrial R&D Scoreboard.
Il est notable que les grandes multinationales ouvrent des centres de R&D à l'étranger pour se rapprocher des marchés sur lesquels elles exportent, et pour

le pouvoir de négociation que ces investissements peuvent procurer face aux
administrations locales (voir rapport de la CNUCED WIR, 2005). Toutes les grandes entreprises du secteur pharmaceutique
(Pfizer, GlaxoSmithKline, AstroZoneca, Sanofi-Aventis, Novartis, Eli Lilly) ont
implanté des laboratoires de recherche clinique en Inde. Même EDF a un centre de R&D à Beijing (Pékin),
consacré aux réseaux, aux énergies renouvelables et à la ville durable. S'il n'y pas forcément une substitution avec
la R&D nationale, cela indique qu'il y a une sorte de plateau des dépenses
de R&D par pays pour une entreprise. La mesure allemande est probablement
motivée par la concurrence mondiale pour attirer de nouveaux centres de
R&D. C'est aussi l'objectif affiché du CIR français.

La
mise en place d'un « CIR allemand » en faveur de la R&D est-elle
de bon augure pour la compétitivité de la France ? L'Allemagne a un avantage
comparatif dans le secteur manufacturier, qui investit beaucoup en R&D. Le dispositif
fiscal allemand renforcera cet avantage, sans risque de contentieux européen,
puisque les aides à la R&D font partie des exemptions du régime de contrôle
des aides d'État de la Commission européenne. L'avantage comparatif de la
France se situe plutôt dans les services. L'effort de R&D des services en
France est plus intense qu'en Allemagne : 0,28 % du PIB en Allemagne et
0,67 % en France. Or, la France se distingue par un moindre

soutien public de
la R&D des entreprises des services. La part du financement public de la recherche
privée dans les services en 2015, était de 4 % en France, contre 11 % en
Allemagne d'après une étude de l'Insee. Le « CIR allemand » ne fera que
renchérir le prix relatif de la recherche privée française dans les services
relativement à la recherche allemande. Or, le contenu en R&D des services
en détermine le prix, puisqu'il détermine son contenu technologique. L'avantage
fiscal allemand va donc accentuer l'avantage de coût des services
technologiques eux-mêmes incorporés dans la valeur ajoutée manufacturière. Cela
va renforcer l'avantage de coût des entreprises manufacturières allemandes.

En
outre, le prix de la R&D est de plus en plus déterminé par les dépenses de
personnel, dont la part dans la R&D a eu tendance à augmenter en Italie, en
France et légèrement en Allemagne. Cette part est à peu près égale dans les
deux derniers pays en 2017 : 61,8 % en Allemagne, 59,7 % en France.[5] L'évolution
relative des salaires des chercheurs aura un impact sur la différence du
montant du crédit d'impôt entre la France et l'Allemagne. Rappelons que le
nouveau dispositif introduit Outre-Rhin n'est assis que sur des dépenses de
personnel. On peut ainsi l'envisager comme un CICE ciblé sur les travailleurs

hautement qualifiés du secteur de la recherche. Nous faisons référence au CICE avant qu'il ne bascule en baisse de cotisations sociales patronales.

C'est la raison pour laquelle nous pensons que l'Allemagne a plutôt voulu poursuivre sa politique d'abaissement de la fiscalité sur les entreprises. C'est une des motivations de la réforme du CIR en 2008, qui « [peut] être vu comme une compensation [fiscale] de taux d'imposition des sociétés plus bas dans d'autres pays » (Lentile et Mairesse, 2009). Le taux médian dans l'OCDE appliqué aux grandes entreprises n'a cessé de baisser depuis 1995 ( 13 points sur la période 1995-2018), passant de 35 % à 22 %. Cependant, le taux allemand, qui oscille entre 29 et 30 % depuis 2008, est proche du taux français (32 % environ en 2020 ; CE, 2020).
L'opposition qui pouvait exister en matière de « philosophie fiscale », entre un système français fondé sur un taux élevé et de nombreux mécanismes dérogatoires, et un système allemand fondé sur une assiette large et des taux faibles, paraît moins forte depuis que l'Allemagne a mise en place son « CIR ».

Ce dernier devrait renforcer l'attractivité de l'Allemagne pour les activités de R&D, qui s'est un peu détériorée (EY, 2020 ; voir également CNEPI, 2019).
Depuis 2011, le Royaume-Uni en tête, suivi de l'Allemagne et la France, étaient

les trois premiers pays d'accueil pour le nombre de projets de centres de
R&D. Depuis 2018, l'Hexagone accueille plus de projets que l'Allemagne (1197
contre 971 en 2019), reléguant l'Allemagne à la troisième place (cela s'était
déjà produit en 2009, en pleine crise financière). Le nouveau dispositif fiscal
devrait influencer l'arbitrage
d'implantation d'entreprises étrangères qui hésitent entre la France et
l'Allemagne. Il devrait aussi attirer des
entreprises françaises en Allemagne, de la même manière qu'une part
significative des activités privées de R&D réalisées en France viennent
d'entreprises étrangères : 21 % en 2015, en pourcentage des dépenses,
comme en pourcentage de chercheurs employés (voir Salies, 2020).
Conformément au droit européen, les entreprises françaises installées
Outre-Rhin, et redevables du « Körperschaftsteuer » (l'impôt sur les
sociétés allemand), devraient pouvoir bénéficier de cette niche.

Enfin,
les organismes privés et publics de R&D localisés en France, devraient
pouvoir bénéficier de l'incitation fiscale introduite en Allemagne, via la sous-traitance.
Mais, ce bénéfice ne sera que marginal, pour deux raisons : la tradition
du « Mittelstand » allemand a plutôt la culture du réseau local et
l'assiette pour les activités sous-traitées est plafonnée

(comme pour le CIR). Les sous-traitants français pourront probablement bénéficier d'agréments, de la même manière que le MESRI délivre des agréments en Allemagne. Depuis 2009, l'Allemagne récupère 6 % des agréments de sous-traitance accordés par le MESRI, le Royaume-Uni, 4 %, etc. La majorité des agréments est accordée à des entreprises localisées en France (75 %).

Quelles que soient les raisons ayant motivé le Parlement outre-rhin à introduire un dispositif fiscal en faveur des dépenses de R&D, il est certain que la France n'a pas intérêt à retirer le sien. Cela ne dispense pas la France de réformer le CIR, les effets de levier n'étant pas aussi forts qu'attendus ; les aides (directes et indirectes), en points de PIB, ont augmenté en moyenne de 5,7 % par an depuis 2000, alors que la R&D, elle aussi en point de PIB, n'a augmenté que de 0,73 % par an. Le peu d'effet de levier est peut-être *la* raison ayant dissuadé si longtemps l'Allemagne d'introduire une niche fiscale pour soutenir la R&D.

En cette période de recherche de moyens de soutien aux entreprises, il va de soi que le crédit d'impôt recherche restera inchangé en France et pourrait connaître une extension du plafond en Allemagne (notamment pour aider les

constructeurs automobiles qui se sont vus refuser un plan de soutien direct).

Ce qui reste navrant cependant, c'est qu'un des motifs de cette introduction se trouve probablement dans l'incapacité des États membres à faire avancer la directive européenne ACCIS qui prévoyait une fiscalité de la R&D harmonisée pour les grandes groupes par une déduction de l'assiette de l'impôt sur les profits des dépenses de R&D. Le CIR allemand pourrait bien faire concurrence au CIR français, conduisant à des transferts de R&D (de la part des multinationales) d'un État à l'autre. L'augmentation nette sur la dépense de R&D des entreprises européennes reste à estimer. Sans augmentation de cette dépense, la politique allemande pourrait être considérée comme une additionnelle politique fiscale non coopérative alors que l'Europe est à la recherche de recettes fiscales communes.

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[1]. Le CIR français intègre, outre les dépenses de personnel, les dépenses d'acquisition des brevets, de normalisation, les dotations relatives à l'amortissement des bâtiments affectés à la recherche, etc.

[2]. Sur la base d'une dépense privée de R&D de 62 milliards d'euros en

2017 (aides
directes exclues), on trouve 0,25 (le taux du crédit d’impôt)
 0,6 (la part
des salaires dans la R&D)  62
milliards  9,3
milliards.

[3].
Pays-Bas, Royaume-Uni, Slovénie, Slovaquie, Belgique, Lettonie, Italie,
Roumanie, Autriche, Lituanie, Portugal, Hongrie, Estonie, Chypre, Grèce,
Bulgarie, Pologne et Malte.

[4]. Le PIB
de ces pays (au prix de marché en 2017) est égal à 2,5 fois celui de
l’Allemagne.

[5]
L’augmentation dans l’hexagone et en Italie est de + 7 et + 20 points
respectivement sur la période 2000-2017.