Memoir

Innovation in germany

(Review of the 2022 OECD report)

Innovation processes

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"*Vulnerability is the birthplace of innovation, creativity and change.*"
(*Brene Brown*)

I. Motivation

The hereby memoir was written to further expand one's knowledge on the innovation system in Germany and being able to compare it with the one in France, indeed, this aim was pursued after studying the innovation system in France via two reports [1] and [2], the former provides us with a qualitative view upon the matter and as for the second a quantitative one.

The qualitative report was commissioned by the French Minister of Economy and Finance at that time (2015), namely "Emanual Macron", in this report the author "Suzanne Berger" remarked at multiple occasions the differences between the French System and the German one, a sentence highlights the disparity, in which the author said : "French and German industrial ecosystems are very different"[1] defining later on an ecosystem as "... regional base of resources and relationships outside any given company…"[1], and further away the author underlines the major attributes making the German ecosystem richer than the French one, among them one can mention : The banking agents, the educational system that produces highly qualified workers…

All of this led to the hereby paper, the purpose of it being the understanding of the "Success" of the German system, how come that the latter is better than the French System? What could the politicians in France or any other countries do in order to converge towards that model (or to be more accurate, to converge towards that success, assuming that each country has its own model and will not be successful by simply "mimicking" another model. One must be able to appropriate the model without becoming a mere clone of it, we must be able to be inspired by it) and achieve the same level of success?

In order to answer all of those questions and get a better picture of the German innovation system, I've taken as a reference the 2022 OECD report on the innovation system in Germany [3].

For the knowledge of the reader the hereby paper is an attempt to summarize and highlight the relevant elements underlined by the OECD report in its first chapter.

II. Introduction

Germany is considered to be one of the best countries in the world. It is a federal republic with 16 states (The politics have been changed after WW2, moving from a centralized government under the Nazis to a decentralized one as it used to be[4]), it has a high standard of living, a strong economy, and plenty of culture and entertainment options for a good work-life balance[5].

All of this is guaranteed (or was guaranteed according to the OECD report) by the four sectors that dominate German industry: the automotive, mechanical engineering, chemical and electrical industry. Those sectors are a source of employment for the Germans, for instance, mechanical engineering (The largest industry in Germany) has 1.1 million employees[6].

Up until 2020, those sectors and the German model in general, was considered an ideal one, bonds issued by the German government were rated AAA by the rating agencies (Moody's, S&P…), since the country was considered with no solvency issues [7].

But during and after the Covid pandemic (the next major event after the pandemic was Ukraine's invasion by Russia), all the governments have been facing off against

unknown situations, with new problems, and Germany was not an exception.

Naturally, to anticipate such events and establish a course of actions, corporates set up stress tests (Those are fictional situations under which companies must go through in order to test their ability to resist crises of any nature whatsoever (Tremendous losses in investment portfolios, natural disasters…), and survive), but no one could've predicted that the world will be facing the covid pandemic and the Ukraine war in a row, not even Germany.

Some issues have been noticed with the German system, making this "ideal system" not flawless as it used to appear. Indeed, it is when confronted with difficulties and unprecedented circumstances that a system shows its flaws.

III. The flaws in the system

In addition to those unforeseen short-terms (hoping the Ukraine's war will be too, a short-term one) events, the whole world has undergone a major change, a long-term revolution, which all countries are trying to be part of, namely "The ecological transition".

After protests, long debates and numerous symposiums, there has been a general consensus over the ecology question, most of the countries are changing their government philosophy to a greener one.

All of which results in regulations not only on a state level (eg. laws forbidding any degradation caused to nature by civilians) but on a corporate level as well, reshaping the economy of the country by reducing the reliance on carbon-emitting energy, migrating towards electrical cars, making investments on a nationwide level to incentivize "The green transition". Among all of these elements two in particular turned out to be critical for Germany : "reliance on carbon-emitting energy" and "migrating towards electrical cars".

As for the first point, germany predominantly sources its energy from fossil fuels (cf. Figure 3.1, The fossil fuels account for 20% of the energy sources) and that has been the case since decades.

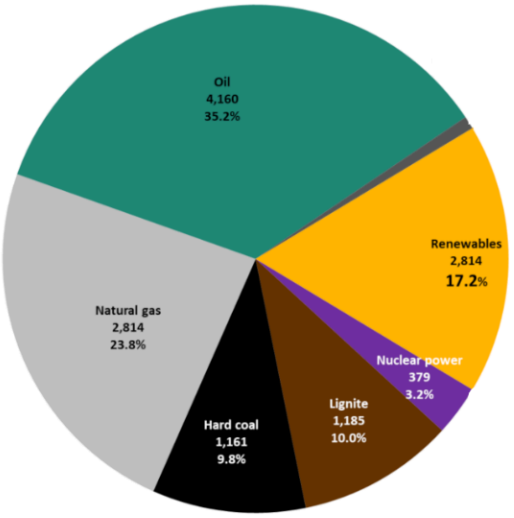

Figure 3.1. German energy mix 2022: Energy sources share in primary energy consumption[8]

This high dependency made germany among the top CO2 Emitting Countries (ranked 7 in the world, cf. Figure 3.2).

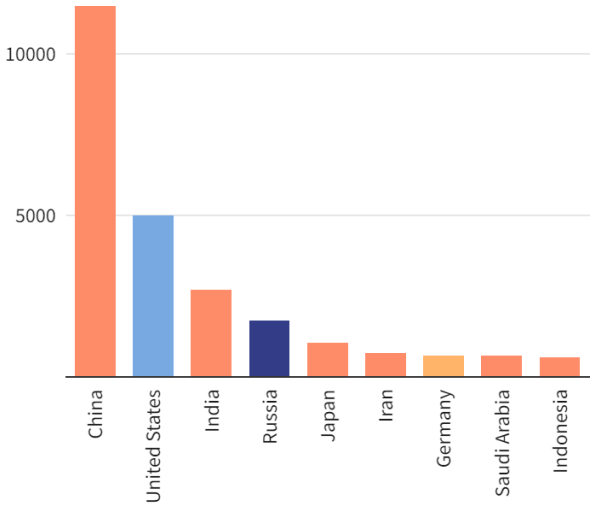

Figure 3.2. Top CO2 Emitting Countries (In metric tons of carbon dioxide, data as of 2021)[9]

Providing all the data above, it is safe to state that germany has to either reduce dramatically its reliance on fossil energy (Which is an objective that has been set, Germany aims to become greenhouse gas neutral by 2045[10], however it shall be somewhat complicated as its European counterparts already have an upperhand in achieving the climate neutrality by 2050 (France and the UK are ranked respectively 21 and 17[11] in terms of CO2 emitting)). Or, Germany will have to develop new technologies and new infrastructures that would speed up tremendously the aforementioned scheme.

This could be achieved by investing more in disruptive innovation which is riskier than incremental innovation but promises high returns in case of success. Which, so far, wasn't the strategy of Germany, as said at the beginning of the introduction, this country has no solvency issues and the bonds that are issued by the government are rated "triple A" which implies that anyone that would invest in those securities will have a high certainty that there will be no defaults, but the returns are going to be smaller if he/she were instead to invest in a "double B" rated bond. Meaning that the German government's strategy is based upon low risk investment (Which is quite similar to the Japanese case).

As for the second critical point for Germany during the green transition is the migration towards electric cars. It is well established that Germany produces cars of the finest quality, and that the automotive sector is a leading one in the country, being a source of exportation (Germany exports of goods and services as percentage of GDP is 43.82% and imports of goods and services as percentage of GDP is 38%[13], and the Export share of the automobile industry accounts for 64.2%[14]) and one of the largest employers in the world (with a labor force of over 857,336 (2016) working in the industry[11]).

Nonetheless, the industry of electric cars requires advanced digital infrastructures and tools (According to the OECD report "Germany has a relatively low level of digital connectivity"[3], indeed fiber-optic broadband connections are substantially below the OECD average, for example in 2019, from the report we read that "1.72% of total fixed broadband subscriptions were for fiber, compared to 8.91% on average in the OECD"[3], among others is the 5G it has been said that "progress (speaking about the 5G field) in Germany so far has been relatively slow"[3]). On the other hand is the dependency on foreign suppliers of semiconductor, the centerpiece of digital transformation.

During the pandemic, the whole global value chain has been disrupted, interruptions in the supply of key component for the development of digital tools and hence electric cars show the fragility of the global supply chains (From raw materials and energy to high-tech intermediate components) which "meant that industry could not produce the output required"[3].

IV. Recommendations

The OECD report opens the analysis of the innovation system in Germany with a list of recommendations (qualitative ones, and more specifically policy-oriented) for the country.

Those recommendations are linked to the issues that have been enumerated in the previous chapter, most of them suggest a solution or multiple ones in order to fill the void that has been created by the aforementioned events (COVID pandemic and the war in Ukraine).

As for the others, these are much more general in scope, for instance the first recommendation :" **R1 : Develop a shared vision "Germany 2030 and 2050"**" by creating a cross-ministerial, federal-state forum in order to steer the process of this shared vision (this vision would unify the whole country over the strategy to be taken and the objectives to achieve in terms of innovation).

This recommendation was also pointed out by the report of Suzanne Berger, on the topic of IRT[1] in France, one of the Nantes industrial leaders told Berger's team "On a besoin d'une doctrine claire de l'Etat et d'une homogénéisation des dispositif. Il ne faut pas treize France" [1], emphasizing the need for unity in a country in order to achieve innovation-related goals. Nonetheless, the OECD report did not demonstrate the lack of unity in Germany in order to justify the establishment of such policy, of the six sections of this recommendation, none showed weak communication between states, or at least divergent views and strategies on the part of länder[2] leaders.

The second recommendation was to create a regulatory sandbox or rather as mentioned in the report :" **R2 : Create a public-private laboratory for innovation-policy experimentation** ", the lab would promote responsiveness and coordination between regions and monitor the impact of policies. The lab would support "breakthrough innovation by promoting the activities of SPRIND[3] and more broadly risk-taking entrepreneurship"[3], the report recommends a lab that would contribute to the unification of the regions and reshaping the global strategy of the government moving from incremental, safe innovation to a more radical and riskier one. Finally, the lab would recruit different profiles making it a melting pot where innovation actors discuss and debate, making a deeper contact between the industry and the research sector, this is quite similar to the recommendation made by Berger to the transfer agency system that has been established in France by : "making Universities and Research organisms interaction with Industry deeper" and "...scientists from research centers spending a few years in government policy making position …"[3]. But in comparison with the Berger's recommendation, the OECD is thriving for Germany to apply it in this "laboratory", in a smaller scope case where experimentation is possible, whereas Suzanne Berger encourages France to apply it nationwide which could mean that the interaction between the industry and the research institutions in Germany is sufficiently deep (which was also highlighted by Berger in her report) in comparaison with the French case, furthermore it would mean (even if not said explicitly) that Germany is moving to another level where it can conduct experimentations on policies in a smaller scale.

As the third, fourth and ninth recommendation:

- "**R3 : Broaden and mainstream the use of agile policy tools to support innovation efforts by SMEs, and achieve the digital and green transitions**"
- "**R4: Improve data infrastructure and data access, especially for industry**"
- "**R9: Digitalise, modernize and strategically use quality infrastructure**"

They are interrelated, since all of them incentivize policies that promote green and

[1] Les instituts de recherche technologique, which are managed by the regions where the IRT are located
[2] States in German
[3] Federal agency for disruptive innovation, in German : Agentur für Sprunginnovationen

digital transition as mentioned in the previous chapter.

The fifth recommendation is related to the interaction between institutions, disciplines and sectors : "**R5: Improve cross-disciplinary and cross-sectoral knowledge transfer and collaboration**", among the subsections of this recommendation, one discusses the interaction between universities and the industry, but not in a manner that could be comparable with the one undertaken by Suzanne Berger in her report, indeed, in this case the OECD reports stresses that the relationship between the actors of these two blocks should be oriented towards the vision that would have been established by the government should they have followed the first recommendation "**R5.1 Improve universities' engagement with industry and support research institutions in playing a leading role in the transitions required to achieve the "Germany 2030 and 2050" vision**"[3], providing the interaction between them with a purpose. Further away, the report suggests the establishment of "knowledge-transfer metrics" enabling the actors to possess a tool to measure the interaction between the industry and the research institutions. Overall, this recommendation also elaborated on the development of startups and increasing the opportunities for open innovation, since it is considered a challenge to gather capital to scale, which brings us to the sixth recommendation "**R6: Promote financial markets that are conducive to scaling up breakthrough innovations**". In the first subsection of the hereby recommendation, the report states that "...public financing organizations provide very little risk capital…" and that "...the German tax framework for equity ownership and awards has been largely unattractive …"[3], which is penalizing for Germany since we are living in an era where Venture capitalism is a popular practice in the investment business, for it promises high yields should a certain business scale, which results not only in a healthy economy but also disruptive innovation and breakthrough technologies[4].

In order to compensate this penalization Germany can"**R7: Strengthen the use of public procurement as a driver of innovation**", the OECD defines public procurement as follows : "...the purchase by governments and state-owned enterprises of goods, services and works…"[15] which of course is financed by the taxes. The report suggests the establishment of programmes (for instance) "to require public agencies to allocate a dedicated amount or percentage to procurement of pre-competitive innovative research"[3] or by creating incentives to engage startups in innovative procurement. This recommendation inquires the government to take actions by being part of the agents that composes the market (what we mean here is that the government is not considered as an entity that regulates the market but instead as a "being" part of it that "interacts" with it by buying services and goods), which so far was regarded by economists as a violation of freedom in the market, any involvement of the government in economic affairs[5] is considered dangerous in a way that it would provide the state with centralized power (although this scenario is unlikely to happen, but still the idea behind this recommendation creates the risk of causing such a turn of events). Of those economists that believe in such a doctrine is Milton Friedman (winner of the Nobel Prize in Economic Sciences in 1976) said in his book "Capitalism and Freedom" that "The preservation of freedom requires the

[4] A good example is Apple, moving the computer industry from military and corporate purposes to leisure one, which brought new techs as the smartphone

[5] This involvement could go from buying goods to partaking in important decision for a firm

elimination of such concentration of power (referring to the government when it gets involved in the market) to the fullest possible extent…"[16]. All that being said, this recommendation could be useful in a way in which the government would incentivize innovation and support the vision, nonetheless the risk remains the same, the one in which corruption could escalate for some unforeseen events (which was the case of Nazis in the thirties, alongside a hyperinflation and the lost caused by the WW1, allowed the socialist party to control the country), yet again, the probabilities are low, but not inexistant, one must not ignore the black swan[6].

The eighth recommendation is connected with the previous since it encourages the involvement of an external agent in the innovation system of Germany, the civilians (whereas in the previous recommendation, it was a question of involving the government). "**R8: Increase the involvement of civil society and key stakeholders in STI policy to achieve the transitions**", the main argument for making the civilian take part in the process of decision making in policy making was : "The debates around ethics in the use of artificial intelligence (AI) tools and gene editing illustrate such impacts (referring to the impacts caused by economic and innovation challenges on society)"[3].This recommendation introduces a democratic aspect in innovation policy making, in this case the civilian will express their opinion on innovation in general and on the innovation policies, it would take the form of councils linked to the forum we've seen in the first recommendation. This would bring diversity to the innovation system by engaging actors that have a different standing point from those who are part of the system, bringing new solutions and expressing problems that people might have and never reached[7] the corporates and the universities. However, including the civilian in the debates could bring further debates and opinions which could turn the conversations over policymaking into endless ones with divergent opinions clashing and never finding a fixed solution or a compromise, while lengthening the process of decision making. In addition to that, the people that would be selected in order to be part of those councils might not have the sufficient knowledge or the ideal background.

All of those policies were aimed to further develop the the German innovation system, and thereafter the report suggests a recommendation that discusses the role of Germany in the EU in general and going even beyond, until recommending that the country takes a higher position in the EU and steer the innovation system of the Union overall, "**R10: Take a leadership role in shaping EU and global innovation policies**". In this section, the OECD report quotes most of the previous recommendations and tries to implement them in the innovation system of the EU, going from developing the German innovation system towards the EU one, indeed the report encourages Germany to "take active leadership in shaping innovation policies at the EU and global levels" [3].

Taking on this role, Germany would promote standards and quality control procedures at the EU level, which would unite the whole EU and align the strategies of the whole members. Furthermore, the German government would strengthen cooperation on an international level, and set an agenda with the main purposes being AI, biotechnology, digitalisation and decarbonisation.

[6] Defined by Hakim Taleb (economist at Yale university) in his book "black swan" as : the random events that underlie our lives[17]

[7] We are referring to problems that didn't reach them by conventional instruments such as straw polls…

Those suggestions are indeed remarkable on the EU level and for Germany as well, nonetheless, the way the report introduced them, indicates that the EU is not applying them (uniting all members on the innovation strategy, aligning the economies…), whether it is the case or not the report did not show any evidence that proves this need, the need of the Germany as a leader. Although there have been one example that was cited and related to the EU and that was the project GAIA-X[8], for which the report said "The example of data infrastructure is telling, with projects such as GAIA-X able to reach a larger scale than any equivalent national project"[3], the report highlights the results of an international cooperation, but this is quite paradoxical since this project was initiated by Germany and France, and not Germany alone, which shows that the EU doesn't require Germany as a leader.

In addition to that, the main purposes upon which Germany will actively be participating in the establishment are mainly challenges that Germany is facing. We are not ignoring the fact that those problems concern as well the EU, but it would be recommended to have a macroVision over the matter and not only a microVision (in this case the standing point of Germany), there might challenges that the EU is facing off against and that have a far greater scope than that of Germany (in this case, it is question of 27 countries and not Germany alone).

V. Conclusion

Germany is a country with a rock solid economy, high standards of living (for which I can witness since I have been living in Germany (Munich) for over a month and experienced the contrast between Paris and Munich, and especially in the educational system, where the student has more independence and manages his/her time as he/she wishes in excellent conditions), and with a well known (for its efficiency) industry, but the latter has been for so long based upon an incremental, low risk innovation philosophy, that has been proved when Germany became dependant on other countries during the COVID pandemics, and even during the Ukraine war (The chancellor of Germany has been criticized (and even was considered a hypocrite) after he visited China[9] (A pro-Russian country in the Ukraine war), which proved that Germany needed the latter regardless of the standing point of this country in the war).

The OECD report highlighted every aspect of Germany's weaknesses and suggested recommendations which were relevant although some of them lacked justifications and others might be revisited if multiple elements were to be taken into account.

This report [3] is a remarkable research paper, well documented, and was useful in order to answer the first question asked in chapter one "motivation" and that was "understanding of the "Success" of the German system" and as it turned out, after reading the OECD report, Germany as all other countries is not perfect, it has its flaws and can improve even more, and with it the French can improve as well.

[8] A project on the development of a federation of data infrastructure and service providers for Europe to ensure European digital sovereignty [18]

[9] China is Germany's largest trading partner, superseding the United States since 2017. The trade volume between China and Germany surpassed 100 billion U.S. dollars in 2008 [19]

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