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How Far Should the Scope of Antitrust be Extended: Innovation, Environment, Privacy ?

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Séverine Schrameck
The use of access to personal data is subject to particularly strong utilization, both at the European level with the GDPR, and at the national level, both in France and abroad, not to mention the constraints resulting from the DMA and DSA. Nevertheless, this does not prevent the consideration of the issue of personal data protection by competition authorities. Very recently, in July of last year, in the Meta case, the Court of Justice of the European Union ruled that a national competition authority of a Member State could ascertain a violation of the GDPR to establish an abuse of a dominant position.

The rise in environmental concerns has led public authorities to produce increasingly stringent standards to guide the behaviors of economic actors towards greater environmental protection, notably at the European level with the Green Deal. Regulatory inflation in this field has been such that French President Emmanuel Macron called for a European regulatory pause in May of last year to allow the industry to adapt to the new Green Deal standards.

In parallel, competition authorities are incorporating the objective of environmental protection. The European Commission, for instance, introduced new guidelines on horizontal restraints in June, which include an entirely new chapter dedicated to sustainability agreements, aiming to ensure that the rules applicable to anticompetitive practices do not hinder agreements among competitors pursuing sustainability goals.

In France, the Competition Authority's 2023-2024 roadmap also identifies sustainable development as one of its major concerns, along with digital technology and purchasing power. These considerations shed light on the challenges related to the integration of the environment and sustainability as new parameters in competition analysis, but also raise questions about the tools of competition law to integrate these objectives. The incorporation of new issues by competition law raises extremely important fundamental questions.

How far can and should the expansion of competition law go? Does this expansion risk generating contradictions and problems of hierarchy with sectoral regulations that are adopted? Furthermore, if competition law pursues new objectives, how can effective and suitable analysis tools be put in place to consider these issues?

To address these topics today, Antoine Chapsal and I have the immense privilege of having exceptional speakers. Philippe Aghion, you are an economist, a professor at the Collège de France, the École des Mines de Paris, and INSEAD. I was joking earlier when I said I don't know where you haven't been a professor. You are an immense expert in the subjects that interest us today, especially innovation and growth, but also the environment on which you have written extensively. Antoine Chaptal will tell us more about you and your career tonight.

Olivier Guersent, Director-General of the Directorate-General for Competition of the European Commission. It's quite a lengthy introduction as well. You have held various positions within European institutions that have allowed you to explore various themes related, of course, to competition, but more broadly to the economic policies pursued within the European Union.

Benoît Coeuré, your experience as an economist, particularly at the Directorate-General of the Treasury, INSEE, and the European Central Bank, has given you a deep understanding of French and European economic policy before becoming the President of the French Competition Authority in 2022.

Antoine, I'll pass the floor to you if you would be willing to delve into the heart of the matter.

Antoine Chapsal
Thank you very much, Séverine. Indeed, I am very pleased to moderate this panel with such impressive speakers. It's best to start right away with a straightforward question: should the scope of competition extend to innovation, the environment, and the protection of personal data?

From an economic perspective, one could argue that these themes fall under the domain of competition policy because they can affect demand and, consequently, consumer surplus.

More precisely, the question would be whether competition policy should consider innovation, the environment, and privacy protection solely through the lens of consumer welfare, or as new and independent social or political objectives. Perhaps Philippe Aghion, you would like to comment on this point, and then we will listen to Olivier Guersent and Benoît Coeuré.

Philippe Aghion
Thank you for inviting me. I will express myself in French during this panel, and I will deliver my presentation in English later. My research area is the economics of innovation and growth, in which I have developed what is now called the Schumpeterian paradigm. The Schumpeterian growth model has replaced models based on capital accumulation. The models I am referring to are models where growth fundamentally results from innovation.

One important aspect is that we have realized that there is a rather positive relationship between competition and innovation, or competition and productivity growth, based on business data from the 1990s, and we couldn't really explain it. We explain it as follows. Imagine you are in a class where everyone is equally good and equally smart, but some are a little better than others. You have the top of the class and the bottom of the class. If I introduce a good student, what will happen? The top of the class will work harder to stay at the top, and the bottom of the class, already discouraged, will become even more discouraged. The same goes for competition and innovation.

If I bring in a highly skilled individual to a market, I increase competition. Companies at the top, at the technological frontier, will innovate even more to stay at that frontier. They will innovate to avoid competition with new entrants. There is a strong Escape competition effect, which creates this positive relationship between competition and innovation, competition and productivity growth. On the other hand, those who lag behind will be discouraged. There is a discouragement effect.

The closer a sector or country is to the technological frontier, the more companies in that sector or country are frontier companies, and, therefore, the overall effect of competition on innovation will be positive. Conversely, if a sector or country is very backward, the discouragement effect will dominate. In the aggregate, we have a U-shaped curve. Starting from a very low degree of competition, increasing competition increases innovation, and from a certain degree of competition, innovation will decrease. In general, if I were to have a linear relationship, it would be positive.

The first idea is that competition is not only important for consumer surplus in a static sense but is crucial in that it stimulates innovation, which will lead to cheaper or higher-quality products in the future. We have a dynamic view of competition. We don't focus solely on the static effects on consumers but on the dynamic effect it will have on technical progress and innovation. This is the first idea.

The second idea is that there has been a decline in growth in the United States since the early 2000s while rents have increased; growth has declined, and rents have increased. We wondered why, and we observed the following. Due to the IT Revolution, the Information Technology (IT) revolution, there were the emergence of superstar companies, big companies like Google, Amazon, or Walmart that benefited from this wave. Being better organized than other companies initially stimulated growth. Initially, the emergence of these superstar companies boosted productivity growth in the United States. At the same time, they became giants and eventually inhibited the innovation of others. They ended up blocking, discouraging entry, and the rate of new business entry in the United States has significantly declined since the early 2000s.

So, there is a real competition problem in the United States, where competition policy has not paid attention to this emergence. It allowed these companies to engage in mergers and acquisitions and become so large that it eventually discouraged the entry of innovative companies. Now, competition policy needs to be rethought, which was very focused on market share and was very static. Richard Gilbert of Berkeley explains this very well in his latest book. We had a competition policy essentially focused on consumer surplus and the static, whereas we also need to ask the question: will a merger and acquisition inhibit future entry or future innovation?

The idea is to reform, improve competition policy to incorporate these dynamic dimensions, and not just a static vision, i.e., static consumer surplus and market share. We are well aware of the limitations of market share, as in the case of Siemens Alstom, when Mrs. Vestager prevented the Alstom-Siemens merger. I thought that we can't just look at market share. First, they were in several markets where they did not represent 100%. I thought the market could be contestable because any country could buy high-speed trains from China within two years, within three years, or at least, prove to me that the market is not contestable. I didn't see that argument developed. I thought I was the only one who had developed it, but Séverine also had the same idea.

This is just to point out the limitations of an approach based solely on market share, which can overlook innovation and the contestable market aspect.

Antoine Chapsal
As a result, there are still no Chinese trains in France. But because they are not needed.

Philippe Aghion
There is no need for them. There is a price ceiling. If you stay below the price ceiling, it's a contestable market. If you raise the price too much, then there will be a temptation to enter. That's what Baumol-Willig tells us; it's about contestable markets. You stay below the price ceiling. Exactly. That's what a contestable market is, right?

Antoine Chapsal
The notion of Olivier Karsenti.

Philippe Aghion
Yes, but I really like Vestager. I don't want to engage in bashing.

Olivier Guersent
In the Alstom Siemens decision, as in any competition decision, there is an extensive analysis of the barriers to entry on this market. Moreover, as is often forgotten, the market definition used was that proposed by Siemes and Alstom. That said, what was at stake was not just a question of potentially higher prices, but, particularly for high-speed train platforms and signalling technologies, a veritable monopolization that the merger of the two groups would have potentially achieved. As for the credibility of an entry into the high-speed market in particular, there weren't, still aren't and won't be any Chinese trains, let alone high-speed trains, in Europe for a long time to come. Because there are a whole host of barriers, more or less legitimate in any case - it's industrial policy - that make it complicated for China to penetrate European markets. The only thing they've managed to do so far, and still by acquisition, is to be present in super-basic freight train technologies.

Antoine Chapsal
Returning to our initial topic, and to also give Benoît the floor. We understand that the idea of having a dynamic view of competition is that we can naturally consider innovation because it will, in some way, affect consumer surplus. Benoît, what do you think about this issue?

Benoît Coeuré

Thank you for the invitation. Thanks to Philippe for initiating this discussion with the required energy. I'm not sure if starting the discussion by focusing on consumer surplus or consumer well-being is the best way to engage in this conversation, as it seems quite theoretical to me. There's a quote from Walter Heller, who was President Kennedy's economic advisor, that goes, "An economist is someone who, when he sees that something works in practice, wonders if it works in theory." What reassured me when I arrived at the Competition Authority was seeing that the lawyers were doing the same. So, that's reassuring.

The way we apply consumer well-being criteria in practice on a daily basis is already quite flexible. There is room for many considerations. For a long time now, we have taken into account diversity of supply and pluralism, including in the media. In our concentration control decisions, we have taken into account considerations of supply diversity, in the media sector as well as in the healthcare sector, in the hospital sector.

Innovation is also mentioned in both the Commission's and our merger guidelines. So I think there's plenty of room for a fairly pragmatic approach. Which raises two questions: on the one hand, should we do it? And secondly, should we do it?

Should we do it? Three topics are mentioned here: innovation, data protection and the environment. In all three cases, these are policies that are objectives of both France and the Union. I have no doubt that competition policy, which is a Union policy applied either at European or French level, must take these objectives into account. As far as the environment is concerned, a specific article of the Treaty on the Functioning of the European Union, Article 11, states very clearly that environmental protection requirements must be integrated into the design and implementation of EU policies. This includes competition policy. When I was at the ECB, we debated how this applied to monetary policy. In fact, I'm very proud of the fact that the ECB is now also considering that monetary policy must take climate change into account. For me, there's no doubt that we need to integrate it as far as possible.

But then a second question arises: are we, the competition authorities, best placed to protect the environment? We can answer this question from the angle of efficiency (who has the best instruments?) and from the angle of institutional and political organization (who has the political mandate to do so, and will be accountable to Parliament and public opinion?) When there is a sector regulator, that regulator must assume its responsibilities, and in all cases where winners and losers have to be designated, the process must be political in nature.

There is a kind of hubris on the part of powerful independent authorities, including competition authorities, who often want to do everything. I don't think this is a good idea. I'd argue in favor of a form of modesty on the part of competition authorities, so that they don't do too much, and that when they do something, they do it well. "Age quod agis", as the Romans used to say.

Sometimes, there is no sector regulator. On neighboring rights, for example, everyone was enthusiastic, starting with the government, that Google's failure to comply with European and French law (which provided for the protection of the rights of publishers and press agencies on search engines) should be dealt with by competition law. This is not the most obvious approach. There could have been a sector-based approach. We approached the subject, I believe, in a reasonable and effective way, with an instrument given to us by the Treaty and the Commercial Code, the abuse of a dominant position, but it could have been done differently.

Philippe Aghion
I can mention something about competition and the environment. It raises interesting questions because competition can have two contradictory effects on the environment. The first is that if you are in a country where there is a demand for environmental products, just as innovating allows you to escape competition, green innovation allows you to escape competition in a country where consumers want environmentally friendly products. Competition here has a virtuous effect of driving green innovation.

The second effect is that competition lowers prices. As it lowers prices, it increases volumes. This is what I call the "Chinese effect," leading to increased pollution. This is what is referred to as a scale effect.

It's interesting because the relationship between competition and the environment is not straightforward. On one hand, you escape competition by innovating in green products because that's what people want. A company that was not virtuous, facing a competitor who is, competition between them will force the former to become virtuous, as otherwise, it will lose its customers to the latter. That's the virtuous effect of competition on the environment.

The non-virtuous effect is that competition lowers prices, and therefore increases volume, which in itself is not good for the environment. That's the first consideration. The second consideration, and we'll talk about policies to combat climate change, is the carbon tax. There is obviously the idea of a green industrial policy. The Americans have their IRA, the Chinese have an industrial policy, and in Europe, Bruegel says, "We need to deepen structural reforms." Hello! We'll have to react to the IRA. We can't just limit ourselves to the "carbon tax"; we will have to implement a green industrial policy.

The question is, how to reconcile green industrial policy and competition? What governance of industrial policy can make it compatible with competition? In the time I was in Brussels, now it may be less the case, it was a Tower of Babel. On one side, you have the competition commission, and on the other side, you have people involved in industrial policy. They communicate more now, but before they didn't talk much. Before, it was the idea that, in the name of competition policy, you should never talk about state aid for sectors. It was "Don't ask, don't tell," and there was this notion that industrial policy was inherently bad for competition. We will have to overcome that and say, no, we cannot reject the idea of industrial policy in the name of competition policy. We need to figure out how to govern industrial policy to make it more pro-competition. That is one of the major challenges now.

Olivier Guersent
You've said a lot of things I could have said, and I agree with Benoit. Economists have been saying it since the beginning of the last century; a Nobel Prize-winning economist even said it some sixty years ago: you can't give a single instrument too many objectives, otherwise it won't achieve any of them. The same applies to competition law: it's not there to do everything. Is it there to protect consumer surplus? That's a huge debate. In my opinion, it's not so clear-cut, at least in Europe. It's there to protect the efficiency of markets in their function of efficient allocation, if possible. And then it's there to protect the internal market. That's essentially how competition policy in Europe differs from American competition policy on a number of points.

Consumer surplus is a practical way of approximating an efficient allocation of resources. That's not wrong either, but as far as I'm concerned, the main objective of European antitrust law is not to deal with consumer surplus. Thirdly, consumer surplus is not something static. I'm a little surprised by this debate, because the competition authorities, the European Commission and many others, have been having it for a long time. Innovation, in particular, has long been a factor taken into account in consumer surplus tests. There's not much new here.

The second consideration is that, obviously, competition policy, as Benoît said, also at European level, does not operate in a vacuum. It's a Union policy, just like industrial policy, decarbonization policy and the fight against global warming, privacy protection policy, and so on. Does that mean it has to appropriate the objectives of these policies? Clearly not. As Benoit says, there are authorities that are there for that purpose, and our role is not to duplicate them. If we try to bend competition policy to achieve all the objectives on Earth, it won't be optimal. On the other hand, insofar as possible and in keeping with its mandate, competition policy must try to help achieve other public policy objectives, or at least not stand in the way of them. I can't imagine a competition decision that would lead to massive CO_2 emissions, for example.

The third consideration is that the three areas of innovation, the environment and personal data protection are very different in nature. Innovation, like price, is an intrinsic part of the competitive process. When it comes to data protection, environmental protection and a whole host of other public policy issues, we need to start by asking a simple question: does the public policy objective in question (e.g. data protection) correspond - or not - to consumer preferences? If it does correspond to consumer preferences, then it's a competitive parameter. Meta and Apple, for example, compete with and, I would say, on very different conceptions of privacy. Apple has made it an element of differentiation. So there are competing models, and the consumer chooses. Rightly or wrongly, you're going to choose because you perceive that this player protects privacy better. Insofar as these phenomena exist, competition authorities obviously take them into account, because it's part of the competitive relationship and the way it is altered by an agreement, an abuse of a dominant position, or by a merger.

For some time now, we've been rethinking the relationship between competition policy and industrial policy. Firstly, because competition policy, particularly in its dimension idiosyncratic to Europe, i.e. the control of state aid, has evolved considerably under the successive blows of the financial crisis, the COVID crisis and now the energy crisis. But also because, perhaps a little less and perhaps not enough, industrial policy has also evolved. The industrial policy of the 80s, in which we chose which steelmakers would survive and which would die. Hardly anyone does that anymore. This kind of binary opposition no longer exists. In reality, competition policy and industrial policy are two policies aimed at ensuring long-term competitiveness. At least their objectives are common, and their means are increasingly aligned. This is clearly explained in the joint communication from Mrs Vestager and Mr Breton adopted by the Commission two years ago.

I'd like to make one final comment. Sometimes, and perhaps this is where we need to dig a little deeper, there are contradictions. Over the last 20 years, at least at European level, we've moved more and more towards aligning the cartel validation test in Article 101(3), which allows cartels to be excused in the name of economic progress, with the merger efficiency test. If you remember the paradigm of the 90s. In reality, 101 paragraph 1 was a good old-fashioned restriction of competition, i.e. of a microeconomic nature, which was weighed against a whole host of benefits, possibly of a macroeconomic nature.

When we changed the standard in 2003, we actually - without really saying so and without much debate at the time - aligned 101 paragraph 3 with the efficiency defense test in mergers. A very micro, very narrow test. The gain, by the way, is that Article 102 introduces an objective justification, which is in fact of the same nature. The result is a beautiful cathedral. It's all very harmonious, but it's not inevitable, it's a policy choice. Obviously, in the context of 101, paragraph 3, it then becomes complicated to take into account a whole host of positive externalities, because they don't fall within the scope of efficiency defence. This is the question we debated at length when we discussed our horizontal guidelines with Benoît and other colleagues within the European network, and in particular how we were going to deal with agreements that are beneficial to the environment.

Sometimes there are head-on contradictions; take resilience, for example. I would argue that a whole host of facts that we consider when analyzing a merger, such as an efficiency that will help counterbalance the possible price effect of the merger, also run counter to the resilience of the system. Let's take a very simple example: you're going to improve your logistics, you're going to have much less inventory, you're going to be more efficient and lower your costs, but you're also going to be less resilient. In reality, this means you'll be creating a potential cost. Under normal circumstances, when everything's going well, you're more efficient, but this also means that the day everything goes wrong, you'll have an industrial accident and everything will grind to a halt. The cost is always there, but in one case it's low and recurring, and in the other it's deferred and random. But it's still there. It's just that its nature has changed. Will we be able to attach as much importance to it in the decision, or do we need to take better account of these resilience objectives and change our concept of efficiency gains? This is the kind of discussion we're going to have to have if we really want to have an industrial policy and a competition policy that understand each other better.

Benoît Coeuré
If I may build on what Olivier said, because we're really delving into the heart of the discussion about what has been achieved in terms of integration, particularly of environmental objectives, and what remains to be done in competition law.
First, on industrial policy, I fully agree with Philippe, of whom I'm a big fan, except when he talks about Alstom-Siemens. Yes, we need an industrial policy that is compatible with competition. I'd just like to add that sometimes we have to invent new instruments to protect both industrial policy and competition. Because we sometimes realize that there were tensions due to a lack of instruments, which brings us back to the Tinbergen principle Olivier

was talking about. The best example is the European regulation on foreign subsidies. I know what many of you in this room think of this regulation, which is not going to be very easy to apply. I wish Olivier all the best. Conceptually at least, the regulation completes a panoply that lacked an instrument to enable European companies to compete on equal terms with their non-European competitors. Until we had this instrument, there was a great deal of confusion in the debate, because many people, especially politicians, thought that competition law could be used for commercial policy. It was a misunderstanding that caused enormous difficulties and misunderstandings between politicians and competition authorities. Now, in principle, we have this instrument. It would be better if it works; we'll see, but at least now, the triangle is complete.

Regarding the environment, and following up on what Olivier said, I think we have made significant progress, but it varies depending on the practices we're referring to. I believe we have made good progress with Article 101(3), whith the new guidelines; we had our debates on fair share and the consideration of externalities. This has resulted in a very European solution, a compromise where everyone sees what they want to see.

Now, we move to practice. When we have some experience, we will see whether the text needs to evolve or not, but I think it's an excellent starting point. For us at the Competition Authority, the priority is practice. As I said before the summer, we will present a text before the end of the year that clarifies how the Competition Authority can issue informal guidance to companies based on Article 101(3), regarding sustainability agreements. We are genuinely committed to this, and I think we have made significant progress.

There is still work to be done in other areas. Regarding mergers, which Olivier also mentioned, I think we are halfway there, meaning we have integrated environmental considerations into our market definition in practice, case by case. But in the SMPR Ardian, for example, we stated that oil pipeline transport was not substitutable for oil truck transport, mainly due to the different carbon footprints of the two modes of transport. This is an example, but it shows that environmental considerations are making their way into our market definitions.

On the other hand, with regard to the effects and what Olivier said, integrating the environment from an angle comparable to that of efficiency gains is only half a good idea, because efficiency gains are in practice never accepted in merger control, as we know. Saying that we're going to do the same thing for the environment isn't necessarily very good news! We need to think more about this and see if we can change things. On the one hand, I don't despair of one day seeing a concentration dossier where efficiency gains can be recognized.

On the other hand, we must continue to think about integrating environmental considerations. I'm not promising anything, because we need a robust standard, and we're going to come up against the question of externalities once again: in other words, are we prepared to authorize a merger that produces environmental gains in a market that is not the one in which the merger takes place? There are good reasons for saying no, because the right instrument is not necessarily competition law, since that would mean organizing transfers between sectors, or even between countries, since we're talking about a global externality. The right instrument is not necessarily competition law, but regulation or taxation. But the discussion is not closed.

Finally, there's a third aspect which is still completely terra incognita, and that's article 102. I think we'll have to think one day about integrating environmental objectives into Article 102. The discussion on the guidelines for Article 102 could provide the opportunity, but I don't think we're intellectually ready yet.

Philippe Aghion
I am far from the technological frontier that my two neighbors represent, but I wanted to comment on the desirable developments in industrial policy and competition policy. To build on what Olivier was saying, he is correct: in order to reconcile competition policy and industrial policy, both need to evolve. Competition policy had a significant ex-ante component. I believe it should move more towards ex-post analysis. For example, rather than prohibiting state aid, we should evaluate ex-post whether they have led to reduced competition, and in such cases, take action. The same goes for mergers and acquisitions; we should assess ex-post whether a merger is harmful to the market and, if so, intervene. There is still much progress to be made, including the development of tools to conduct ex-post evaluations in competition policy. These are desirable evolutions.

On the side of industrial policy, the United States has created something remarkable called DARPA, the Defense Advanced Research Project Agency. It's brilliant. Why? Because it's a combination of top-down and bottom-up approaches. We are in a situation where fundamental research has been done, but there is a need to coordinate actors and resources to immediately transition to applications and fulfill missions. DARPA emerged in the context of the 1950s when the United States was racing against the Soviet Union to put a man in space within two years. What's clever about DARPA is the top-down approach; the funding comes from the ministry. They have team leaders who come from academia or industry, serve for three or four years, and have complete freedom to initiate competitive projects. Here comes the bottom-up part. Competitive projects are a way to conduct highly pro-competitive industrial policy. DARPA gave us the Internet, GPS, and many more. Its biological counterpart is BARDA, the Biomedical Advanced Research and Development Authority, which has been crucial in fighting COVID-19. It used the same system as DARPA. Several labs competed, and the state mobilized resources, production tools, and various labs that submitted proposals. Some succeeded, some didn't, and that's how we got out of the pandemic. In Europe, we don't have the equivalent of DARPA. I would like to see European DARPA-like organizations, especially in the fields of energy, health, defense, and space, because it's an intelligent and highly pro-competitive way to conduct industrial policy. The question is why we can't create worthy European DARPA organizations. I believe this is a significant question.

Olivier Guersent
I don't think the answer is very complicated. It's because we are not one. We are 27. American interests are quite clear and internalized by U.S. decision-makers. That doesn't mean it's straightforward, but at least they know what American interests are, and they don't need long discussions or public discussions to construct them. But we do, because European interest isn't the same as French interest, German interest, etc. It's neither obvious nor natural; it has to be built.

Three existential crises later, we are better off, but we're not there yet. Benoît and I lived through the financial crisis. It was a long learning process for the Member States but that has paid off. The European recovery plan, with European debt accepted by Chancellor Merkel, is a product of the financial crisis and the learning curve that the Germans went through. But we're not yet to the point where we have a clear idea of what European interest is, nor are we ready to prioritize this second-rank optimum for each nation over its first-rank interest, which is national interest strictly speaking. That's why we don't have a DARPA, and we can't have one until we make that leap to adopt collective interests. There isn't really a willingness to do it either because if there were, we would strengthen mechanisms for defining common European interests and consensus and give them more power, which is not the case. It's a shame, but that's how it is. I agree with you; the advantage of the DARPA system is that you don't choose the winner. You place bets on all options, and then you see what comes out. It's pretty smart, and in the end, it doesn't cost more and may even cost less than what we traditionally do in France. It's also an approach based more on competition and less on the selection of winners by public authorities.

Regarding the Innovation and Research Act (IRA), I don't entirely agree with you. First, during the State of the Union address, it was mentioned that, especially in the field of hydrogen, the investments in Europe in one year exceeded those in the United States and China combined. Secondly, when people say the IRA is fantastic, it is $400 billion over ten years. Do you know how much we've provided in public subsidies in Europe in the same fields over the last two years? We provided €600 billion, not €400 billion, in just two years, not ten. We need to stop talking about the IRA. In Europe, we are providing more subsidies than the United States.

Let's take another example. Much of innovation comes from synergies between defense and civil applications. We admire the Americans, with their military budget. We spend a lot as well in Europe as 27 countries, but what kind of synergies are we achieving? They are minimal. First, because a significant portion of what we spend goes toward buying American equipment, even when we are part of European programs developing similar products. Second, because we are not spending smartly and in a coordinated manner. This will continue until there's a realization that we need to transition to a collective definition of interest at the European level.

One point where I disagree with you, Philippe, is that it's not possible to control operations ex-post. The British and Americans have a fantastic expression for this: you can't unscramble eggs and put them back in the shell. It's complicated after the fact.

Benoît Coeuré
However, you are undoing one, on a specific case (Illumina / Grail).

Olivier Guersent
Sometimes we don't have a choice. When the eggs have been broken, even though we told the companies not to do it, we are forced to unscramble the omelet.

The reason why merger control cannot be done ex-ante is that if we were to do it every time, it would be quite complicated. The same goes for state aid; we cannot wait for state aid to produce anticompetitive effects and then demand repayment afterward. State aid repayment does happen, but honestly, it's better if it remains the exception because it causes considerable collateral damage. In general, even if we have a chance of making mistakes, of course – that's the problem with ex-ante control – it is still a lesser cost than ex-post control in these two particular cases.

Philippe Aghion
But in that case, why not make state aid contingent? Instead of rejecting state aid because it falls within a sector that is already competitive or cannot be given to a single company, I can more easily authorize it with objective criteria. It's not just a random decision. Seriously, what I'm trying to say is that I will examine whether the sector is already competitive enough – here's the Erfindhal indicator – and then I'll look at it objectively. If you're giving everything

to a single company, I'll say no. If you're distributing aid to at least as many companies, maybe I won't say no, you see. We can do more ex-ante, as you're already doing now. I said this with Almunia ages ago, and we were already moving toward the idea of making ex-ante control a bit more flexible.

Olivier Guersent

In reality, with ex-ante control, we have a first criterion. The entry point is that there must be a market failure. It's quite simple: if there's no market failure, there's no need for public funds. It may seem obvious, but it's challenging to make member states understand this. When there's a market failure, the second principle is that the subsidy cannot exceed what is necessary to correct it.

Of course, it's challenging to model, so we use rough approximations. If we take a risk, it's more likely to be one of overdoing rather than underdoing because once we've authorized state aid, it's quite ridiculous if the project fails because we were a bit too stingy. We tend to be a bit more generous than less, even if it slightly violates the treaty. This is why, in such cases, we need to set up "claw-back" mechanisms to recover ex-post overpayments.

Benoît Coeuré

In a word, I'd like to reinforce the cry of alarm about the future of a European industrial policy that would be the juxtaposition of the 27 industrial policies of the member states. I think this is completely ineffective. We're heading for disaster. And why is that? Everyone at this table agrees that competition policy and industrial policy are complementary, because an industrial policy without competition will never produce the desired innovation. But if we stay at national level, we'll never be able to exploit this complementarity. We won't be solvent, because the size of the market won't be sufficient to bring out the champions we want to see emerge. I'd like to add an argument that hasn't yet been put forward, which is that if all this is done with State aid and by stretching the elasticity of State aid ceilings, as has been done until now, it means that we're turning the discussion on industrial policy and competition policy into a budgetary discussion between Member States, and that's completely toxic. I experienced this at the ECB. There was a time when, because the eurozone crisis was a bond market crisis, the discussion of monetary policy became a discussion of fiscal policy. It was absolutely toxic. Do we want to ask 27 finance ministers to make the Union's industrial policy? It's better not to try, because budgetary policy is at the heart of what has not been shared between member states. It's the heart of sovereignty. We can't ask them to give that up, that's normal. It doesn't work, it's politically toxic, it creates animosities between Member States, and we can see that today, for example on the energy market, and particularly between France and Germany. I find this extremely worrying, because we're not going in the right direction at all to create the pro-competitive European industrial policy that the three of us have been calling for.

Philippe Aghion
I talk too much, I talk too much. I found Mario Draghi very interesting during his speech at the NBER, where he gave the Martin Feldstein lecture when he said that we should increase European borrowing capacity. Europe can borrow more, as we did during COVID, and in exchange, Member States become more fiscally responsible. We've reformed pensions here, and we've done other things. It's more reforms to reduce recurring expenses in France, and other countries should also undertake reforms. There's a contract, and from the moment we have European borrowing, we can finance a European DARPA. That's a first idea. It's a way to tackle the budget issue step by step.

There's a model that has worked in Europe, the European Research Council, which aimed to be the European equivalent of the National Science Foundation. It works quite well because there's no quid pro quo. Countries don't ask to receive as much as they give. There's no veto on projects; there are amounts, and juries that decide on the projects. I believe we can apply the ERC's logic to select industrial projects. We could envision a DARPA that selects in this way. I think if we can say there's no law of "I want my money back," no veto; maybe it will be a "Coalition of the Willing." Perhaps initially, a few countries will form a DARPA, and then other countries will join in. In my opinion, it will be a "whoever likes me, follow me" situation, as everyone will want to be part of it. I think there's a way to approach the issue that would promote the idea of a "Coalition of the Willing," not "I want my money back," and no veto, with the ERC in mind. I think these can be guiding principles to kickstart European DARPAs.

Antoine Chapsal
A seemingly naive question about consumer surplus can spark a debate. I believe I have understood "the hard way," as my colleagues across the Atlantic say. Times have changed, and the idea was to allow those who dare to venture into this debate to ask questions. So, with the consent of the speakers, I propose that we open the floor to questions.

Question
Benoît Coeuré said that we should broaden the objectives as much as possible. My question is, how do we measure what is possible? I have always considered the great strength of competition law to be its measurability or its ability to produce results that are measurable in terms of prices or quantities. I do not have the impression that there is a consensus on how to measure the appropriate level of innovation, data protection, or environmental benefits.

Perhaps it's due to ignorance, but is there a sufficient consensus to incorporate these objectives while keeping the quantifiable nature of competition law?

Olivier Guersent
I'm afraid you're under an illusion of a bygone era when everything was quantifiable. That was never true. In reality, for instance, in Article 101, you spend your time comparing apples and oranges. If you're lucky, you have a quantifiable and quantified effect on price. If you're lucky because later, the experts will tell you that the confidence intervals are not as reliable as you thought. But let's assume you have them.
Then, what you're going to put into balance is innovation, or a set of other more qualitative things. Look at the list in Article 101-3. It's like an inventory of random items, and so we've always done that: compare quantitative and qualitative. That's why I was amazed by the debate in the doctrine around the guidelines on whether consumers should be completely compensated. Or is it enough for them to be slightly compensated? It's a debate that should not exist because no one can tell you that consumers are compensated at 99% or at 101%. That was never true. In the end, there was always a judgment. This judgment is made by competition authorities, under the control of the courts. Is the consumer compensated enough? Are the efficiency gains resulting from the merger sufficient to likely generate the positive effects that outweigh the negative ones? Moreover, it's about mergers; we're talking about the future, which is even harder.

Antoine Chapsal
We have fairly precise tools to see the impact on prices. We have developed econometrics, for example. I don't think econometrics will predict the future, but I know that we have developed measures of the impact of concentration on prices, which is evident. The question is when we'll have to measure the effect of a merger on the environment, if it ever needs to be done. Perhaps Philippe has precise methods to do that.

Olivier Guersent
You need to measure the effect of efficiency gains on prices.

Antoine Chapsal
We know that it's easily dismissed.

Olivier Guersent
Not at all. You have to make a bunch of assumptions. Let me give you a little anecdote. One of my most humiliating failures as a civil servant occurred in 1994 when I was in charge of the merger that combined the seamless tube activities of three companies. On paper, it created

a perfect duopoly with the Swedish company Sandvik. The DG Competition offers a prohibition. It was prohibited because we believed the parties. We believed that they would successfully integrate an Italian, German, and French culture and create competitive firm.

Fortunately, we weren't followed by the board and we had to authorize the operation, for the wrong reasons (the arrival of potential competition that never came), but in the end we were right, because the efficiencies that had been forecast by the parties never came either. And the result was that, a year later, Sandvik had an extremely dominant position on its own. And our friends at the three companies had divided their market share threefold. So we can see the limits of over-precise predictions when it comes to quantifying the price effects of mergers.

Philippe Aghion
There have been significant advances in data, new patent products, growth, and productivity. We've made progress in measuring, telling you how poorly we measure productivity growth. We tend to overestimate inflation and underestimate productivity growth. Now, we have means to examine job creation, destruction, turnover, patents, entry, etc., which can allow us to say a number of things. We didn't have these five or ten years ago. There have been considerable advancements in metrics, specifically. I think that now, we can do much more than we could before.

Benoît Coeuré
I'm optimistic about our ability to improve the measurement of effects in different dimensions: on prices, on innovation, on the environment, and so on. There has been a revolution, a complete paradigm shift in data analysis over the last fifteen years or so in economics, which has not yet fully reached competition economics. I think we can make huge improvements in the way we collect and use data. In the end, Olivier will be right, and we'll have a multidimensional analysis on dimensions that can't necessarily be aggregated. That's why I don't like the concept of consumer welfare either, even though it's the conceptual basis of everything we do. Because it falsely gives the illusion that we're going to find a common metric that will enable us to aggregate gains or losses of different kinds. And so, when we look at the impact of a concentration on the diversity of supply, we do so as best we can, quantitatively when we can. But we're not going to aggregate this with price effects - we don't know how to do that. In the end, there will always be an element of arbitrariness, and so the judge will have to agree with our arbitrary way of aggregating these different dimensions.

Olivier Guersent

This is where competition policy doesn't operate in a vacuum. Obviously, in this margin of judgment, if you have a general policy with clear objectives, this orient the judgment, at least trying not to contradict those objectives.

Séverine Schrameck
First of all, I want to thank you for this discussion, which I find more interesting than I initially imagined because it's quite political.

Benoît Coeuré
That's very kind of you.

Séverine Schrameck
I found that there was a very high-level view of competition policy in the political sense. So, that's what interests me. And there are two positive points in what you said, in my opinion, in this regard. First, the idea that competition policy, which means maximum market players in the internal market, will generate industrial developments. I think we've come back a bit on that, and I was also very interested in what all of you, especially Philippe Aghion, said about consumer welfare and price reductions, which may not necessarily align with industrial development.

So, two points. First, what you said about the European Research Council is an extremely interesting starting point, as we are looking for what's called European projects of European interest and importance, which we have never been able to develop. For example, Galileo. From that, I would propose that we remove the framework research programs, which are not only sprinklings but an unparalleled bureaucratic machine in the world.

Philippe Aghion
Which doesn't select the best.

Séverine Schrameck
I think we should abolish them and indeed have an open concept, because the ERC programs also include Norwegians, Israelis, etc. and an open concept of the European project of European interest, which can be in collaboration with third countries. I think that's a very good idea.

A small question about the European Defense Agency, I have no idea what it does. Is it a success? In any case, I hope that the Commission, officially, as it has never done, will stop considering that the arms industry should be excluded from the social taxonomy, which is absolutely ridiculous, associating arms with child abuse and violation of the rights of indigenous peoples. This was a proposal made by the Joint Research Council, which was ridiculous but still affected the share prices of the French arms industry. So, I would like to know your position on this point; it has to do with Russia and not necessarily competition.

The second point on the ex-post. Well, it's true, Olivier, you're right, you can't unscramble eggs. Mergers and acquisitions, with all the economic and financial consequences of a divorce, are unimaginable. However, regarding state aid, we have an extremely fragmented view of state aid, sectoral state aid. Therefore, we need to categorize between the environment, local development. It's still a bit outdated, in my opinion, this sectoral approach, because now we are increasingly in interdisciplinary fields. I wondered if the ex-post could finally be considered in one of the cases: when the European Union, the 27, does not agree on anti-dumping rights, or on a trade policy, coercive measures against aggression, especially in renewables, Chinese batteries, Chinese photovoltaics, and at that time, we give back to the Member States the freedom to defend their national industries. That is, considering that if there is a failure of dumping measures or foreign subsidy measures, at that point, we can try to protect the domestic industry, because photovoltaics in France, and tomorrow the batteries, I absolutely don't believe in them either, because the Chinese are cheaper, they work more, we don't want to work, and they have taken the lead.

Philippe Aghion
One must not forget that competition policy in Europe was conceived for a political reason of integration. It was designed for that, so we must keep that in mind. Often, economic tools have been used to achieve political objectives. The Euro is another example, by the way. I'm very much in favor of the Euro, and I'm in favor of competition policy.

Some have argued that the problem in Europe is that competition has been very inward-looking and perhaps not outward-looking enough. That is, there is competition within our borders, which is important, but there is also competition with the United States and China, which is important. How do I adapt to this world? I don't want to be entirely inward-looking.

Olivier Guersent
I'll start with state aid, defense, and pedocriminality questions. These are somewhat outside my expertise in both cases. But regarding the taxonomy, the one I endorse is the environmental taxonomy. It has little to do with these subjects. It's essential to remember that it's nothing more than an information tool for investors. Why did we develop a taxonomy? It's quite simple. I thought that at some point, there should be a system with science behind it,

with a credible process, with an institution that endorses it. Then, you use it or don't use it, and this system allows you to have an idea of whether your investment is geared towards a 2050 carbon-neutral goal.

Two things: first, about being open to the outside. I believe you're absolutely right. It's true that one of the objectives of competition policy has always been the internal market. Competition policy is one of the policies of the internal market. I remember that there were price differences of 30% for the same car depending on whether you were in Belgium or France. My predecessors spent years fighting against market segmentations caused by that. We had to change many things, like VAT, which is quite complicated, but we got there. It has always been an important dimension, it still is today, and it's certainly pre-eminent in the case of state aid, where we need to prevent those with deep pockets from deeply fragmenting the internal market. It hasn't been doing that incredibly well.

That said, we are also evolving, and we are opening up to the outside. Simply to make you aware of an element of our current crisis and transition framework, which is Article 1, Paragraph 2, Paragraph 8, from memory. In this transitional part, there is something explicit that has always existed, called the matching clause. This means that if there is no competing project in Europe, which is the internal market aspect, and if the company chooses to invest in a third country because it receives large state aid, or if it chooses to invest in Europe, then the European country in which the investment takes place can match the foreign aid, normally within the limits of the funding gap; otherwise, it becomes a windfall. This is entirely new. This has been formally introduced in this case. Today, we have cases that benefit from this, not many, but do you remember when the European Investment Bank intervened, and business leaders were explaining that they were going to close everything in Europe to reopen in Arizona, especially in the chemical industry? When you know the costs of closing a chemical site in Europe, it's not funny. The real problem is for greenfield projects; should I do my next project here or there? Still, it's essential to know that state aid comes quite far when you do surveys in the order of decision factors, and the decision-makers are first in line, that's where the demand will be. Secondly, what are the infrastructures, etc. And finally, if I also have state aid, it's great. And there, among projects with similar characteristics, it could potentially be the deciding factor. The typical example in Europe is Toyota in Valenciennes; they could have been on the other side of the border, in Belgium (inaudible), but they wouldn't have been in Romania. They were there because they wanted to use the Channel Tunnel, export to England, etc. The matching clause is still one of the signs that we are opening up to the outside.

The last point on state aid, let's not exaggerate. From memory, 96% of aid measures in Europe are not notified to Brussels because they either benefit from a regime or are exempted by category. And that's the great work of Ms. Vestager in her first term: we'll make rules, and if you're in the box, we don't want to see you. So what remains is 3% of aid measures, representing 10% of subsidies. But of course, it's 10 billion to Intel. and it's worth looking at because it has absolutely colossal effects on the fragmentation of the internal market. When you give 10 billion to a company, and you have a European competitor called ST Electronics, it's not very surprising that the boss calls you to say, listen, it's already complicated to compete with Intel, but Intel on public funding steroids, in my domestic market, you'll have to help me. This is where you're getting into things that state aid policy is there to prevent, namely the race to the bottom because once you've aided one, you can't let the other die.

KEYNOTE SPEECH

Philippe Aghion | Professor, London Business School, Harvard University - Economy department, Cambridge, Collège de France, Paris
Antoine Chapsal | Managing Principal, Analysis Group, Paris

Antoine Chapsal
Dear Philippe. Thank you for accepting our invitation this evening, and before giving you the floor, I'll try to sum up your immense career in just a few minutes.
As everyone knows, you are first and foremost an outstanding researcher. You have published 150 articles in the most prestigious economics journals. You have also published 8 books, some of them textbooks that have become indispensable, others aimed at a wider readership that have helped to extend your reputation far beyond the academic world.

But these staggering figures do not capture the major impact of your research. Here are just a few of your major contributions.

In 1987, together with Patrick Bolton, you published an article that fundamentally challenged the Chicago School critique, very much in vogue at the time, that a firm could not profitably extend its market power. In this article, you show that a dominant firm can, on the contrary, effectively use an exclusivity clause to extract the rent of a new entrant and potentially exclude it from the market. You present the first "theory of harm" associated with exclusivities, making a major contribution to post-Chicago models and to the recent economics of competition that we all apply here in our various cases.

In 1992, with Peter Howitt, you made a fundamental contribution to growth theory, integrating the Schumpeterian idea of creative destruction. Innovations improve productivity but render existing technologies obsolete. By modeling these concomitant phenomena of destruction and creation, we can better understand how economic growth can be sustainable.

In 2005, you presented fundamental work on the link between competition and innovation, showing that innovation is strongest when the intensity of competition on the market is neither too low nor too high.

Most recently, you analyzed the role that competition can play in the development of eco-responsible technologies, making important contributions to the debate between competition policy and climate, which you'll be telling us about in a moment.

You are also a unanimously recognized professor. Before taking up the Chair of Economics at the Collège de France, you taught at the most prestigious American universities, MIT and Harvard, and at the best British universities, Oxford, UCL and the London School of Economics. Today, you are a professor at INSEAD, one of the world's most renowned business schools.

But above all, throughout your academic career, you have shown a constant willingness to open the doors of these institutions. How many French students have been able to go to Harvard thanks to you? I know some, as you know, for whom this opportunity changed their careers.

The "Campus de l'innovation pour les lycées" (Innovation Campus for High Schools) that you initiated is a clear example of this desire for openness. The aim of this campus is precisely to familiarize high school students from disadvantaged areas with research in economics, political science, biology and mathematics. You are desacralizing academic knowledge to show these students that scientific knowledge - economic theory, for example - is a tool for understanding and acting on the world.

The "Farhi Innovation Lab", the research center on the economics of innovation that you founded, is also based on the same principle, mobilizing talented young researchers and world-renowned specialists, with the aim of gaining a better understanding of how innovation works, the drivers of productivity and business dynamics.

Last but not least, you are an intellectual committed to public debate. You defend the ideas that education and innovation, which should be encouraged again and again, can lead to sustained, less unequal growth. This optimism, which breaks with the defeatist theses that are reemerging in the face of an admittedly uncertain economic situation, is one of the many reasons why I am delighted that you have agreed to speak to us this evening.

Thank you once again.

Philippe Aghion

It is very intimidating to be presenting here and having been introduced so generously by Antoine, I can only disappoint you. I would like to say a few words about introducing innovation in the climate debate. Before I do that, here is a picture of young Schumpeter and his concept, the notion of creative destruction, the process whereby new innovation displaces old technologies, for example, that Schumpeter explains in *Capitalism, socialism and democracy*, which was published in 1992. He is standing here with Peter Hoyt in 1997 at MIT, were we developed a new growth paradigm because in fact, there was no Schumpeter model. There was no empirics. We had to build a framework and we built a new model that rests on three main elements. First, long-run growth is driven by the cumulative process of innovation, where each innovator builds upon previous innovations. The second idea is that innovations do not come from heaven. They are the result of entrepreneurial activities, R&D and other types of investment motivated by the prospect of innovation rents. You innovate because you will get, at least for a while, a monopoly rent because you have a better product or you produce cheaper. The third idea is creative destruction. New innovations displace old technologies. They render old technologies obsolete.

What's interesting with this theory is that, at the heart of this Schumpeterian paradigm, there is a contradiction. The contradiction is that on the one hand, you need innovation rents to motivate innovation. But on the other hand, yesterday's innovators are tempted to use their rents to prevent subsequent innovation, because they don't want to be subject to creative disruption. Regulating capitalism is all about how you manage this contradiction. Whether you talk about inequality, secular stagnation, middle income trap, whatever.

There are two distinctive predictions of the theory. The first one is that growth is positively correlated with turnover, because where there is more growth, there is more creative destruction. You should see that wherever you have more productivity growth, you have more firm turnover. Indeed, whenever you want to represent creative destruction on the horizontal axis by firm or job turnover and productivity growth on the vertical axis, you will tend to see a positive relationship between turnover and productivity growth.

The second thing is that more intense competition enhances innovation in frontier firms that are close to the technological frontier but discourages innovation in frontier firms. That's what I did in Nick Bloom's paper with Richard Blondell, Peter Howey and Rachel Griffith and Nick Bloom. On this diagram you see that the blue firms are the firms close to the technological frontier and that innovation and growth of these firms react positively to competition. Whereas the orange and the red firms are the ones that are far below the technological frontier in the sector. There we see that innovation and productivity growth reacts negatively. Of course, the more developed the country is, the more blue firms it has compared to red firms. That's why when you are more developed, competition becomes more growth-enhancing. But when blue firms innovate, it is to escape competition with their rivals.

Let me talk about climate. The first thing is the following. If you look at temperature, you can see that temperature started to rise in the early 19th century. In France, but maybe also in other countries, there are those who advocate degrowth. They think that the way to solve the climate problem is to have negative growth or degrowth. But historically, temperature started to rise when we had the take-off of growth. We know from Madison in particular, that growth took off in 1820. Growth as we know it is only 200 years old. And temperature started to rise exactly at the time where growth started to rise. It's true that historically, temperature rise has everything to do with growth. Should we go back to the pre-19th century? We have the experience, more recently, of China and India. CO_2 emissions of China and India started rising exactly at the time of their take-off of growth. Does it mean that we should go back and have negative growth? No, because we had the lockdown with COVID. We remember, for example, in France, between March and June 2020, GDP went down by 35%, and CO_2 emissions went down by 8%.

Do we want to be permanently in a lockdown? No way. We don't want to follow those who advocate degrowth, because we know we've been through degrowth. The young generation was completely sacrificed, and we don't want to go back to that. The only alternative is to have innovation. It's the only way to get out of the Malthusian logic, because it increases the range of what can be done. We have to find new sources of energy that are clean, new ways to produce that are less energy intensive, new ways to adapt to technology better, maybe even ways to cool the air. I call that amelioration.

You have three kinds of innovation ; those that mitigate, meaning those that slow down the rise in temperature. You have the innovation that allows you to adapt to warming, but also the innovation for amelioration. The physicists of Harvard work on geoengineering, which is a very promising technology to cool the air. Other people are working on other technologies, and all of those have to be taken seriously.

Innovation is part of the debate. What's very interesting is that the first economist, Nordhaus, who got the Nobel Prize in 2018 for his work on climate and growth, didn't touch on innovation. It was pure models of capital accumulation with no innovation there. It's crucial to have innovation.

What happens when you put innovation in the climate debate? Before, we used to have a debate between Nixton and Nordhaus. Nixton would say, well, you should put more weight on future generations. Nordhaus would say you should put more weight on current generations. All the debate was what I call the discount rate. Nixton says, because I put more weight on future generations, we should act right away because I think of the future. Nordhaus would say, no, that would not be fair on current generations, and therefore we should be more progressive. That was the debate, the discount rate, and that was it. Now, when you introduce innovation, you get various implications.

Let me tell you what happens when you introduce innovation. One is path dependence. Innovation is a way out, but the bad news is that firms that innovated in dirty technologies in the past tend to continue innovating in dirty technology in the future. You tend to keep doing what you are good at, and that's called path dependence. In joint work with the Shelley Press, Amus, Martin and von Riennan, we look at the flow of clean and dirty innovations in the car industry. You can see that the past stock of clean and dirty innovations is a big determinant of the current innovations.

If I have a big stock of dirty innovation, I tend to be dirty. The problem is that firms spontaneously don't do the right thing. You need the state to redirect the innovation of firms towards clean technology and the question is how you can redirect it. That's the important role of the state. The bad news there is that path dependence implies that under *laissez-faire* the technology may get stuck with dirty technology. But the good news is that the government can avoid disaster by redirecting innovation towards clean technology.

The interesting implication from that is that first creative destruction helps you. What does creative destruction mean? When new firms come, they don't have the path dependence problem. So if you boost creative destruction, you are already helping in solving the climate problem because you replace old firms with new firms that do not have the path dependence problem. Another implication is that you should act right away, because if you don't, firms will continue innovating in the dirty innovations and the gap between dirty and clean technology will widen up. It will be more costly tomorrow to intervene. It's like the dentist. When you have a cavity and you wait to go to the dentist, the cavity becomes deeper and more drilling is required and it's more painful. That's a very important thing.

You can see here (on the projected diagram) that if we wait, of course we have more growth. But then you see that you go below. If I act now, of course I force firms to do things they're not so good at doing. I forced them to adopt innovation, I taught them to do clean innovation. When you intervene, it means reduced growth. But if I do it now, the period of reduced growth is limited. If I wait, the period of reduced growth will be longer and I will lose. Even with the discount rate of Nordhaus, you want to act right away, because if you don't, firms will spontaneously innovate in dirty technology and it will be more costly tomorrow to make them adopt good habits.

That's the first implication. The second implication is that you have two externalities. You have path dependence, which is a knowledge externality, and you have the environmental externality. Usually when you have two externalities, you need two instruments, not one. Some people believe you can do everything with a carbon tax. Rubbish. No, you can't do everything with a carbon tax. You need a carbon tax, but you also need subsidies for clean innovations because one will help you with the environmental externality, but the subsidy will help you with the knowledge externality. You need two instruments. You need, in fact, a carbon tax and a green industrial policy. For example, in the Blanchard report we wrote we had our friend from Toulouse, they are very much pro-carbon tax. Nixton and I had to fight very hard to make them put the two legs; the carbon tax leg and there is the industrial policy leg.

Now, I would like to say one last thing. I spoke about the role of the state and I would like to talk about the role of civil society. In fact, we know that consumers can push firms to innovate green because they become informed. They know that there are clean products and they will tend to go there. In fact, what we show in this work with Roland Benabou, Ralph Martin and Alexander Roulette, is that in this table, the values in the first row means the extent to which a firm is exposed to countries where consumers value the environment. When you are dealing in countries where consumers are more concerned about the environment, enterprises spontaneously cater to the consumers. That's the role of civil society.

But the third row is also very interesting. You see that this effect is stronger when there is more competition. Today it's all about competition. Competition enhances the extent to which firms cater to consumers that value the environment. It's very simple. Okay, case one, I know that consumers want green products and I'm the monopolist. I'm the only seller of those goods so they have to buy from me. Now if another competitor comes along, I have to become virtuous. Otherwise, I lose my consumers to you. In fact, I have to innovate green to escape competition from you. It's not that I just innovate to escape competition from you. I innovate green to escape competition from you.

That means that you need a triangle. In conclusion, innovation-based claims and models suggest action may be taken urgently, and multiple instruments should be used. One must act now. Firms innovation plays a role, but you also have the state and civil society. You have a triangle. The firms do the innovation and both the state and civil society are there to redirect firm innovation towards me.

I would like just to conclude firstly with industrial policy. We need industrial policy because we have a coordination problem. Typically, there are value chains, and you have complementarities across the layers of the value chain and you need to coordinate them. Industrial policy is very important there. If you want to do it only with the Pigovian tax, you need a huge one which is completely inefficient. Industrial policy has a role to coordinate the various layers of the value chain to move towards electrification and to move towards clean. There is a true role for green industrial policy on top of a carbon tax.

The second thing I would like to tell you is the role of finance. It's very interesting because I'm doing some work now, and I look at the German banks. Commerzbank had big problems with the financial crisis. What happened? Firms that were dependent on Commerzbank had to cut back on innovation. The green patenting was very much sacrificed on the right-hand side by those banks. That shows the evolution of green innovation by those firms that depend on Commerzbank compared with firms that do not get financing from Commerzbank. You see that Commerzbank is having problems. The credit crunch sacrificed green innovation, particularly in the young and small firms which are the most prone to green innovation. That's very interesting from a macro perspective.

Why is it important? Because if you now have a monetary policy against inflation that only uses the interest rate to fight inflation and you raise interest rates a lot, you will increase the cost of borrowing for firms, in particular for small firms, and you will delay the green transition.

I don't say that you should not of course have restrictive monetary policy when you face inflation, of course you should. But you should take into account that you are in the process of energy transition. And if you rely only on interest rate increases to deal with inflation, you will have such big interest rate increases that you will kill green innovation in small firms. You will delay the transition to a clean economy. We know that global warming is one source of price instability, so you will shoot yourself in the foot. When you have inflation policy, it has to merge interest rate policy to reduce demand, but also it has to involve industrial policy to increase supply. You have to think differently about anti-inflation policy, when you are in the process of energy transition.

In France, we have a big public debt, but there are some politicians that are obsessed with it. They are ready to cut anything to reduce the public debt, including green investment. I think that's crazy, because as I told you before, you have to intervene right now to prevent firms from innovating dirty.

If you wait, you increase the cost of the move to a clean economy tomorrow. You increase the cost of the transition. It means that if you are obsessed with the monetary debt and you just say because of that, I delay green investment, you will increase the environmental debt of the future generation, and they will have to spend more in the future to get out of it. Now you cannot look at the debt without looking at the same time at the environmental debt. You have to look at both debts together. That's a new way to do budgetary policy. You have to do monetary policy differently, and you have to do budgetary policy differently.

Finally, financing the energy transition in Europe. In France, we have a specialty which is inventing new taxes. I even have close friends of mine who cannot resist this, and want to reintroduce a wealth tax and all that. I believe that's a big mistake.

I compare the energy transition to the building of railroads in France in the 19th century. We had to cover France with railroads very quickly. The state could not do it on its own. It had to rely on the private sector and on partnership to do development banking. It was in partnership between the state and private interests. If you start taxing them like crazy, you will make them run away and you won't do your energy transition. I believe that what you should do is to have. We talked before about European borrowing, which is warranted by the carbon tax, the ETS recipes, that gives you a basis of, let's say, €500 billion, that you can use to do development banking. You know, the EBRD (European Bank for Reconstruction and Development). For each euro the EBRD puts on the table, they finance a three euro project, because the rest is put by the private sector.

Suppose that with the European borrowing that we hope will happen, you could use like the €500 billion and mobilize an additional 1,000 billion euros. Then, you can really do a serious energy transition.

A last word on European institutions. The problem with Europe is, we are a regulatory giant and a budgetary dwarf. The expression is from my friend Matthias. I think it is very true. The problem we have in Europe is that we are very good at regulating, but in terms of budget, we are ridiculous. The European budget is 1% of GDP, and the problem is that we have various tools. They are good. The Maastricht treaty to make sure that the euro is sustained.

You can't do excessive deficits. Competition policy, which is made by very good people, we have them here with us now. We have various instruments, but the problem is to modernize them, and you have to modernize them if you want the energy transition. How do you modernize these instruments? You should not count recurrent spending in the same way you count investment in green technology. You should not put these two types of spending on the same footing. That's Mario Draghi there. You have to adapt Maastricht and say, I don't put on the same footing the pension spending and investment in green.

Second idea: competition. In the name of competition policy, we should not go against industrial policy. We saw today, there is big hope and there is a big, very positive evolution. It was not like that 20 years ago. The Competition Commission was an anti-industrial policy. They were very much on the Anne Kruger line. And the third thing, the budget is small. We need to allow for European borrowing.If we modernize Maastricht the way we practice it, if we have a competition policy which is more favorable to industrial policy. I think there is optimism here today.

If, thirdly, we allow for European borrowing, of course, combining that with discipline on the part of the states, and that's exactly what Mario Draghi proposed in his lecture that he gave at the NBER, the Martin Feldstein lecture of Mario Draghi, which I highly recommend. I think if we move the European institutions this way in Europe, we can have something serious to help implement the energy transition. Thank you very much.