
Revolution or passing fashion? Reassessing the precautionary principle

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Abstract : Precaution has been for years a controversial issue. Some regard it as a major regulatory innovation. Others as an inherently flawed concept. Some consider it an approach still in its beginning. Others a passing fashion. A narrow understanding of its relationship with knowledge and its distributional effects may explain why discussions on the US-EU divergence and on Europe's own ambivalence about precaution fail to provide a consistent picture.

I make a case for a broader perspective: the issue of precaution is related to the social division of labour, namely the intimate connection between knowledge and power. The modern narrative, drawing a sharp divide between (science-based) production and use of knowledge, has faced growing public criticism. The controversy on precaution mixes up tradition and innovation in an ambiguous way, gaining special saliency in Europe vis-à-vis the elaboration of its social model. If tradition is increasingly in trouble, innovation has perils of its own.

Keywords : precaution, knowledge, risk, uncertainty, power, narrative, science, politics, division of labour, social solidarity, transatlantic divide, European Social Model, disenchantment of science.

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Introduction

Precaution, or the precautionary principle (hereafter PP), has been for years a controversial issue. Some regard it as a major advancement in risk regulation. Others as an inherently flawed concept. Some consider it an approach still in its beginning. Others a passing fashion. In this article I address the issue by applying the notion of division of labour and argue that precaution is likely to remain at the forefront of conceptual inquiry and regulatory innovation.

I first examine some critical aspects of the PP. I contend that they are usually addressed in an exceedingly narrow way. As a result major assumptions concerning the division of labour on knowledge and the underlying structure of social solidarity remain hidden. The consequence is a loss of interpretive capacity: the picture of risk regulation across the Atlantic is actually rather blurred. To take one step forward I elaborate on the division of labour perspective, namely on the relationship between production and use of knowledge, the reasons for its growing saliency and the different ways its paradoxical character has been addressed. It is the overlap of contrasting accounts of the division of labour on knowledge that makes the PP issue so entangled. The controversy in Europe provides a test case of my argument. Europe's ambivalent approach to precaution is related to its wavering between different self-understandings as a society, as the debate on the European Social Model indicates. I conclude by arguing that if the limits of a conservative approach to the governance of risk and innovation are increasingly evident, the prospect of a thorough rethinking raises major questions.

Understanding precaution

Questioning precaution

Definitions of the PP are many and diverse (Sandin, 1999). For example the famous ones provided by the Rio Declaration (UN, 1992) and the Wingspread Statement (1998) differ in many respects. The former refers to cost-effectiveness of preventive measures; the latter does not. The former talks of threats of serious or irreversible damage; the latter of any threat to human health or the environment. The latter asks for a reversal of the burden of proof (that is, issues of relative safety, harm prevention and alternative examination are to be addressed by the proponents of a technology rather than, as usual, by the public and government authorities); the former does not. The EC Communication on precaution (EC, 2000a) seems to lie somewhere in between, by connecting the application of the PP to potentially dangerous effects deemed inconsistent with the chosen level of protection and by referring to a case-by-case application of the burden of proof reversal clause. These and other definitions do however agree on the crucial role of (scientific) knowledge. The rationale of the PP lies in a preventive action against potential harms vis-à-vis the 'lack of full scientific certainty' (Rio) about them, when 'some cause-effect relationships are not established scientifically' (Wingspread), or where 'scientific information is insufficient, inconclusive or uncertain' (EC).

Knowledge is pivotal also to criticisms of precaution. 'Risks are often on all sides of a social

situation, and risk reduction itself produces risks. [...] Regulation can create dangers of its own. [...] Hence the PP [...] forbids the very measures it requires' (Sunstein, 2005: 366). Substitutes for toxic chemicals, for example, have their own problems. And if, in front of uncertainty about the effects of some substance, it may look sensible to assume that its dose-response curve is linear and with no safe thresholds, this may produce adverse outcomes since 'many toxic agents that are harmful at high levels are actually beneficial at low levels' (Sunstein, 2003: 1026).

Someone even talks of the logical inconsistency of justifying precaution with uncertainty. 'If we insist that we are "completely ignorant" as to which of the events $E_1 \dots E_n$ will occur, it is hard to escape the conclusion that all the events are equally likely to occur' (Majone, 2002: 103). This argument bravely reverts the usual understanding of the relationship between risk and uncertainty – uncertainty becomes a particular case of risk (one where probabilities are all equal) rather than risk being a particular case of uncertainty (one where the possible occurrence of events is calculable). Yet it mistakenly conflates the notions of risk and betⁱ and does not consider deeper forms of uncertainty, for example when possible events are unknown (Funtowicz and Ravetz, 1993; Stirling, 2001; Wynne, 2001).

The basic objection, however, remains: taken literally the PP would have paralyzing effects, 'forbidding inaction, stringent regulation, and everything in between' (Sunstein, 2003: 1003). A looser interpretation – roughly corresponding to the rule 'leave a margin of safety' – seems to critics no less problematic, either bordering on banality or entailing perverse effects. Overreaction to a target risk (trying to reduce as much as possible false negativesⁱⁱ) may result in the increase of a countervailing risk. 'Regulations causing risk-risk tradeoffs pit some life and health interests against other life and health interests' (Wiener, 2004: 90), which means that 'the search for higher and higher levels of safety [...] ultimately imposes high costs without achieving significant additional safety benefits' (Majone, 2002: 105). Diesel engines, for example, help reduce greenhouse gas emissions but increase local air pollution by particulates. And if the EU's standard for the B₁ aflatoxin additive in food is estimated to reduce deaths from liver cancer of 'less than two lives in a billion in Europe, [is this] worth the misery imposed on African farmers?' (Majone, 2002: 106). Moreover 'adopting precautionary regulations can incur the cost of false positives: financial losses, restricted freedoms, and the foregone health and environmental benefits of restricted technologies' (Wiener and Rogers, 2002: 321). According to critics, therefore, one should either axe the PP as such or reduce it to a cost-benefit analysis (CBA) with a 'margin of safety' added whenever dangers produce special concern because of their catastrophic potential outcomes and the impossibility to assign probabilities (Posner, 2004). This, at least, 'when the costs of reducing those dangers are not huge and when incurring those costs does not divert resources from more pressing problems' (Sunstein, 2005: 383). The basic problem, in fact, is that 'resources are limited and if we spend large amounts of resources on highly speculative harms, we will not be allocating these resources wisely' (Sunstein, 2003: 1019).

Broadening the frame

There is something paradoxical in Majone's statement about the implications of non-tariff barriers. Can European citizens concerned with their health be held responsible for the misery of African farmers? Are we sure that no other public or corporate policies bear greater responsibilities? His argument is however a good example of the dead end of speculative considerations stemming from an exceedingly narrow understanding of the PP issue. Browsing the literature it is easy to find that precautionary measures are considered either disproportionately beneficial or disproportionately onerous to wealthier people and countries, or that they are supposed to lead to either an understatement or an overstatement of risks (cf. e.g. Sunstein, 2003: 1031-33; Wiener, 2004: 88-90). The problem is that in order to agree with any

argument one would need some specification. What is the information and what are the stakes deemed relevant? Who has defined them? What are the states of affairs taken as a starting point and a desired outcome of a policy? According to what criteria has one to consider sound or flawed the choice to focus on a single risk instead of multiple simultaneous exposure; to define or leave unspecified thresholds of critical damage; to choose one or another animal test species; to make or avoid linear extrapolations of harm from high to low doses of a substance?

Moreover, what resources are we talking about? And whose? What do we regard as reasonably allocable to a goal and who is the legitimate decision-taker on a resource? One may argue, for example, that by burying electric power lines we devote resources to a minor danger diverting them from greater problems, like urban pollution. Yet this argument makes sense only by assuming that our budget is fixed. Have we considered, for example, shifting part of our weapon expenditure to environmental policies? Are we only talking of public funds or have we considered to compel companies to use part of their profits? Evaluations about resource allocation are affected by strong normative assumptions, often hidden behind descriptive expressionsⁱⁱⁱ. Any trade-off analysis is framed by an 'other things being equal' clause the content of which is usually taken as self-evident rather than a crucial issue.

Why, for example, should more restrictive regulations necessarily hamper innovation? The opposite may be the case, as happened with car emissions standards. And why innovation should be equally beneficial to everybody? Why, in other words, should one look at the distributional effects of precautionary policies without considering at the same time those of innovation policies? Moreover, labelling an issue as a matter of 'risk governance' rather than of 'innovation governance' affects the scope of reflection. The legitimacy of the related choices and their overall benign and desirable outcomes are taken for granted (Felt and Wynne, 2007). As a consequence the public is assumed to focus only on risks, while it may be more concerned with the broad impacts and justifications of innovation. Type III errors – providing sound answers to the wrong questions (Schwartz and Carpenter, 1999) – are sometimes more relevant to technological controversies than any alleged or real divide between risk takers and risk avoiders.

Such divide, moreover, is framed in a narrow way by many critics. Precautionary orientations would be related to 'cognitive mechanisms' (Sunstein, 2003; 2005): loss aversion, belief that nature is basically less dangerous than human interventions; cognitive availability of some risks to the detriment of others; focus on harms rather than benefits or misperception of the costs of precaution. Thus the foundations of precaution would be largely irrational. However when dealing with social action a good rule is to search for the reasons of anyone for adopting a belief, before labelling it as rational or irrational (Boudon, 2003). Indeed there can be good reasons to be risk averse, for example that no evidence of harm does not correspond to evidence of no harm, and one may wonder why assuming that human interventions are less dangerous than nature would be more rational than assuming the opposite. Moreover the micro-macro link is a very delicate issue. One cannot simply extend properties of individuals to collectives without specifying the transfer mechanisms (Coleman, 1990). Explaining why some organizations or states are more precautionary than others, therefore, becomes tricky.

A more promising strategy is to reflect on the existence of systematic preferences for reducing false negatives or false positives. For example, health agencies or technology end users should in principle be more favourable to precaution than industry and scientists. The former are more directly affected by the harmful consequences of false negatives while the latter are more directly affected by the implications of false positives on the profitability of investments and the proceeding of research^{iv}. Or, looking at one category of actors, ecologists should in principle be more concerned with false negatives than geneticists, because the latter are used to think in terms of direct cause-effect relations and the former in terms of complex interactions (Sarewitz, 2004). The choice of one or another policy framework may also affect the relevance assigned to false negatives and false positives. For example, false negatives are likely to be more relevant to a 'social justice' framework, often adopted by local groups: if the main concern is about the unfair

distribution of costs and benefits, then ‘expensive avoidance policies are warranted on the basis of a few credible scientists suspecting a small risk that violates the rights of even a small group of people’. False positives, on the contrary, are arguably more relevant to an utilitarian framework, often adopted by economists, engineers and regulatory agencies, for which it is sensible to search for the option ‘that produces the best trade-offs between various criteria, [that is to choose] the solution that aims at producing “the most good for the most people at the least cost”’ (Neutra et al., 2002: 2).

To sum up, many critics (indeed also many supporters) of precaution take an exceedingly narrow perspective, addressing its relationship with knowledge and its distributive implications without questioning the framing assumptions according to which their discourses make sense. These assumptions can be connected with systematic preferences for different regulatory approaches; systematic in the sense that they are related to the actors’ position in the social division of labour – the way the tasks to produce the material and immaterial goods necessary to ensure the survival and prosperity of a community are distributed’. In this sense the ‘other things being equal’ clause does not regard so much resources in the narrow sense of goods – or money as their symbolic substitute – as what is assumed to be a legitimate allocation of rights to manage and enjoy them, to hold social positions, handle public matters, define collective goals. It regards, in other words, assumptions concerning the structure of the social tie, or social solidarity as Emile Durkheim (1893) and many others call it: the formal and informal, legal and moral, rules that underlie collective belongings and, with reference to different issue-fields, specify rights and duties, capabilities and disabilities, criteria for charging responsibilities, accepting justifications, attributing blame and reward.

The position in the division of labour provides actors with their own viewpoints, or ‘interests’ if one wishes. One should use this term with care, however. Again, a narrow understanding may be misleading. Many critics of precaution, for example, consider the European commitment to the PP as a means to protect domestic economic interests. Yet why should protectionist aims be valid only for Europe and not for the US or other states? Only because of Europe’s alleged fear of globalization, ‘especially if globalization means Americanization’ (Wiener and Rogers, 2002: 339)? And if European regulations respond to a risk averse public, why would Europeans be more so than Americans, provided that their interests as citizens or consumers should be the same here and there? Perhaps ‘interest’ has to be taken in a broader or deeper sense. The original Latin word, *interesse*, means at the same time ‘to ‘lay in between’, thus referring to a relation between subject and object, and ‘to make a difference’ or ‘to be relevant’, thus referring to the subject’s attribution of value to the object, according to how the latter is described by the former. Cognitive and normative aspects, therefore, intimately co-operate in building issue-framings and goal appraisals that often resist a shallow, straightforward interpretation.

The transatlantic divide on precaution

Contrasting accounts

Possibly the best way to grasp how the politics of risk regulation resists simplified accounts is to look at the literature devoted to comparing Europe and the US. Everyone is eager to recognize that on both sides of the Atlantic risk regulation is grounded on a set of ‘presumptions about the obligation to prevent collective harms in rational, democratic societies, committed to principles of solidarity and to the acquisition and use of knowledge’ (Jasanoff, 2003: 228) and that, nonetheless, the European and American approaches differ significantly, with particular reference to precaution. At this point, however, the picture becomes troubled, since these differences are accounted for in two contrasting ways: divergence (or ‘flip-flop’) and convergence (or hybridization).

According to the former ‘one can discern a trans-Atlantic shift in defining what constitutes politically acceptable health, safety and environmental risks since the mid-1980s’ (Vogel, 2003: 1). The US used to be stricter or more advanced than Europe in many policy areas (e.g. chemical regulation, automotive emission standards, and environmental impact assessment). Though sometimes this is still the case (e.g. blood donation), the fields where European regulation is stricter or more innovative have increased (e.g. hormone-treated beef and milk, GM crops and foods, eco-labelling, automobile and electronic recycling, packaging wastes). The US have never formally adopted (and indeed have often contested) the PP, while public discussion about it ‘is several years behind that in Europe’ (Tickner and Raffensperger, 2001: 183). The American tendency towards formalised, quantitative analysis vis-à-vis Europe’s more qualitative and informal approach has been confirmed and even strengthened along the years. The Reagan administration stress on sound science and CBA (cf. Executive Order 12291) has been echoed by the Clinton administration (cf. Executive Order 12866) and by recent regulations like the 2001 Data Quality Act (Wiener and Rogers, 2002; Ingram et al., 2004; Krämer, 2004). Judicial review of agency decisions has become more stringent since the 1980s. This ‘hard look’ doctrine promoted by the Supreme Court puts larger evidentiary burdens on decision-makers, treats uncertainty as a problem of quantification and emphasises CBA (Tickner and Raffensperger, 2001: 198). Finally, ‘in the US risk assessment and risk management are handled by the same institution, while in Europe they are formally separated. Precautionary elements tend to be built into risk assessment in the US, while in Europe the precautionary principle primarily informs risk management’ (Vogel, 2003: 41-42).

Other authors, however, maintain that ‘the notion of a great transatlantic struggle over risk and precaution is misleading [...]. There has been no general “flip-flop” of relative precaution between the US and EU’ (Wiener and Rogers, 2002: 319). The US adopted precautionary regulations in the 1980s and 1990s, one example being the 1990 Clean Air Act Amendments, while Europe has been less precautionary as regards for example BSE and contaminated blood. It is indeed possible to talk of an ‘iterative exchange of legal ideas, tools and approaches; [...] fractals interacting at many junctures as they both evolve’ (Wiener, 2004: 79). Regulatory solutions differ according to ‘the risk, the technology, the location, the era, the public, the agency, the legal system’ (Wiener and Rogers, 2002: 342). In its turn isomorphism^{vi} depends on contextual constraints (for example the diffusion of right-to-know legislation or corporate pressure to regulatory harmonization); the experts’ endorsement of similar beliefs and approaches; the mimicking of successful regulatory models, as with the agencies system (Halfman, 2005). Vogel himself seems to support the idea of a regulatory convergence when he remarks that ‘the EU is simultaneously strengthening its scientific capacity to conduct risk assessments and encouraging public participation; new regulatory agencies [have been established]; [...] the courts are playing a more active role in reviewing the regulations’ (2003: 41).

Hybridization or convergence regards not only the contents of regulation but also the regulatory styles, that is the overall layout of institutions, rules and practices. The traditional US model is fragmented, adversarial, transparent, and highly reliant on science; the European one draws to a greater extent on elite negotiations behind closed doors. America however has gradually developed more consensual regulatory approaches to reduce litigation costs, while Europe has promoted transparency and public participation and given greater emphasis to scientific advice. In the US risk assessment and management were traditionally treated as separate steps, while in Europe the distinction ‘was for many years unclear’ (Löfsted and Vogel, 2001: 401). However the US National Research Council has more recently argued for combining the two areas (NRC, 1996), while both at national and EU levels a strong case has been made for their separation (RCEP, 1998; EC, 2000a).

Contrasting explanations

The contrast between different possible ways to compare the American and European regulatory approaches extends to the explanations. Three different categories of factors have been singled out: historical, institutional and cultural.

For Vogel both the US and Europe experienced ‘a series of alleged or actual regulatory failures that eroded public confidence in government regulation’ (2003: 22). For the US the crucial period is between 1960 and 1980 (Love Canal, Three Mile Island, Rachel Carson’s *Silent Spring* etc.); for Europe between mid-1980s and 2000 (Chernobyl, BSE, contaminated blood, dioxin in food supply etc.). Majone strengthens this argument maintaining that ‘Europeans have experienced a series of regulatory failures largely unknown to Americans. Hence it is not surprising that Americans trust their risk regulators while Europeans do not’ (2002: 107). Citizens’ declining trust and increasing risk-aversion allegedly leads to tightened regulatory contents, more transparency and higher resistance to business capture. According to this reading, therefore, the success of the PP depends on the necessity to restore trust in the regulators, to the point that ‘once trust is restored and once regulators see that the costs of precautionary legislation outweigh the benefits of it’ (Löfsted, 2004: 252) a shift towards quantitative risk assessment and CBA is to be expected, as happened in the US.

Institutional factors, however, downplay the role of regulatory failures. ‘Highly legalistic and adversarial, with a strong role of decentralized decision-making in courts’ (Wiener, 2004: 96), the US regulatory style relies ‘on formal and highly specific rules and standards with a high degree of suspicion of informal contacts between regulators and industry’ (Halffman, 2005: 457). To survive judicial scrutiny the formal record of regulators ‘heavily relies on scientific certainty’ (Tickner and Raffensperger, 2001: 196), with a sharp distinction between science and policy. Though characterized by significant national differences, the European style is by contrast more cooperative, hierarchical and centralized. It lacks a strong tort law and relies on elite negotiations and use of personal expertise rather than standardised knowledge, with an often ambiguous (in practice if not in theory) science-policy boundary (Halffman, 2005). As a consequence, ‘mistrust of government power may itself be a reason for American reluctance to embrace the precautionary principle as a formal principle, while European legal culture may be more comfortable with principles of obligatory regulatory action’ (Wiener, 2004: 96).

Institutional and political change is also stressed as an important factor. Environmental and consumer groups play a prominent role in the US in the 1960s and 1970s but go on the defensive with the Reagan and Bush administrations’ appeal to ‘private property rights as a basis for challenging environmental policy’ (Jasanoff, 2003: 235), while as already said judicial review turns to the ‘hard look’ doctrine. In Europe, by contrast, the Greens enter national and EU Parliaments and the European Court of Justice (ECJ) starts to stress that ‘the protection of the environment is one of the essential objectives of the community’ (Christoforou, 2004: 24). The EU’s regulatory competences on environmental and health matters expand; at the same time the fragmentation and interdependence of policy-making at national and European levels broaden the opportunities for environmental and consumer groups to exert influence and strengthens the demand for stricter Europe-wide rules (Krämer, 2004; Vogel, 2003).

In their turn cultural factors downplay both historical and institutional ones. Some scholars refer to issue-specific factors: ‘European populations may be more susceptible to some risks and American populations more susceptible to others’ (Wiener and Rogers, 2002: 335). For others ‘America and Europe have fundamentally different orientations towards nature’, with the US focussed on ownership and dominated by ‘an expansionist frontier mentality’ and Europe characterised by a ‘more intimate and pervasive’ relation with the environment (Welsh, 2006: 64). Traditionally, it is argued, Europe ‘has had a stronger commitment to social and more recently environmental concerns than the United States’ (Krämer, 2004: 67-68). The American cultural lean towards individualism and technological optimism would explain why ‘more than

any other industrial society, the United States has sought to ground all kinds of policy judgements on a foundation on numbers' (Jasanoff, 2002: 374), devoting as a consequence more attention to well-defined short-term risks than indeterminate, long-term ones. Moreover, 'during the 1990s public confidence in technology, business and government regulation increased in the US, just as they declined in Europe', and independently of the relative lack of regulatory failures the American citizenry has 'become somewhat less risk-averse' (Vogel, 2003: 32-33), with an increasingly influential role of market-oriented values of competitive individualism and a growing attention towards 'the prospect of countervailing risks that may arise from efforts to reduce target risks' (Wiener, 2004: 93). From this perspective, therefore, cultural frames count as explanatory factors far more than institutional settings or regulatory failures.

The ambivalence of Europe

To this already blurred picture one has to add Europe's own ambivalence about precaution. The Commission's Communication (EC, 2000a) recognises the relevance of scientific uncertainty while at the same time requiring CBA: how the latter can be carried out vis-à-vis a non-calculable risk is however unclear (Graham and Hsia, 2002: 379). CBA, the Communication says, should encompass economic and non-economic considerations, public acceptability of available options included. Yet it is again unclear how public views can be combined with CBA and an equally required science-based risk assessment, and who should ascertain the public acceptability of an option (Majone, 2002; Scott and Vos, 2002). In other words there is a 'fundamental tension – unacknowledged and unresolved – between emphasis on non-arbitrary, rational decision-making on the one hand, and transparency, participation and responsiveness to public opinion on the other' (Scott and Vos, 2002: 278). Proportionality is kept distinct from CBA, yet it is possible to argue that the former is a conceptual equivalent of the latter (Vogel, 2003: 41; Wiener, 2004: 76)^{vii}. The only difference with the American approach might thus lie in the 'high level of protection' chosen as an external parameter to measure proportionality and, consequently, perform CBA. Such expression however is left undefined, which may allow considerable discretion in its interpretation in any particular case. The ECJ, in its turn, has justified recourse to the PP without a full risk assessment (Löfsted, 2004: 248), stressing at the same time the necessary provision, for precautionary measures to be adopted, of 'evidence of specific, concrete risks rather than merely potential risks based on a general preventive approach' (Scott and Vos, 2002: 265). According to the Communication minority opinion of credible scientists should be taken in consideration, yet it is unclear how to weight this opinion against the majority and what happens if a minority 'believe that a proposed precautionary action may do more harm than good' (Graham and Hsia, 2002: 382). The Communication states also that it aims at avoiding recourse to the PP as a disguised form of protectionism. Yet, particularly with reference to the US-EU dispute on the hormone-treated beef, it is maintained that the PP expands regulatory discretion 'to practise protectionism, or to reclaim national autonomy in politically sensitive areas of public policy' (Majone 2002: 89-90). Finally, according to some the use of the PP as a basis of regulation 'has peaked. Signs within the Commission indicate that there is little consensus to further use of the precautionary principle in its strictest form, that is reversed burden of proof and regulating based on harm rather than risk. Costs on those regulated (e.g. industry) may simply be too high' (Löfsted, 2004: 251). Such signs are found in the growing importance given to competitiveness and efficiency testified by such documents as the White Paper on governance (EC, 2001), the Communication on economic competitiveness (EC, 2002a) and the Communication on regulatory impact assessment (EC, 2002b).

Science and politics in the division of labour

A basic antinomy

Risk regulation is a multifaceted topic and the debate cannot but reflect that. Yet, as we have seen, the overall picture is blurred. Ultimately one is unable to grasp the reasons for the transatlantic differences and the European ambivalences on precaution, and the actual import of both issues. A possible strategy, then, is to broaden our view of the PP – our understanding of what precaution is about – as I have started to do by introducing the division of labour perspective. The task is now to follow this way and see where such perspective leads us.

Let's start with Mary Douglas's (1992) argument about issues of risk being political issues and public debates on risk being debates on politics. What does it mean, precisely, this statement – if it has any meaning?

A first remark is that, independently of a realist or constructionist account of the contents of knowledge, its production and use are to be recognised as socially grounded – that is, they are related to a division of labour and the underlying social tie, or solidarity structure. Moreover, in its broadest meaning politics consists of the authoritative way to allocate values within – that is, to take decisions for – a community (Easton, 1965), which corresponds to the enforcement, reproduction and change of a division of labour. In this sense knowledge is constitutively intertwined with politics. No cognitive activity is possible without a will: an interest, a direction, a question. Normative commitments inevitably affect the production of knowledge. Conversely knowledge affects politics. Even a principled decision, a decision where matters of fact are not considered, is a decision implying the statement: 'I know' (that this principle is right, that God wants it etc.). Even the most absolute political power cannot simply say 'I want' without implying 'I know': Hobbes's Leviathan can impose his will to all the citizens because he knows what is good for them.

The relationship between knowledge and will is thus ultimately antinomic – that is contradictory or paradoxical. Full-fledged knowledge is nothing else than will. And full-fledged will is nothing else than knowledge. The Almighty is such because He knows everything, and vice versa. Such antinomy is potentially disruptive, to the extent that a society is built upon a division of labour – an articulation of tasks, rights, duties, abilities and inabilities. In fact the antinomy is usually expelled from social order, symbolically projected over it (a God, a mythical sovereign etc.). It lies behind the division of labour, the rules of which may meaningfully connect power and knowledge only by assuming their original separation. At critical junctures, however, the antinomy comes to light; the intimate connection between knowledge and power becomes visible and problematic, so that knowledge seems intolerably reduced to politics, or politics to knowledge. Old rules, traditional roles, are called into question; a new division of labour, a new legitimate order, has to be established.

This happened at the beginning of modernity, as the dispute between Boyle and Hobbes testifies (Shapin and Schaffer, 1985). The institutions of modern science and the modern state have co-evolved (Funtowicz and Strand, 2007), their legitimation stemming from an asserted sharp division of labour between science and politics – the former deals with facts and nature, the latter with values and interests (Latour, 1993). A division which actually entails a strong reciprocal presupposition. On the one side the cognitive aspects of political power become particularly prominent, its legitimacy being grounded on rational competence in controlling the world (Weber, 1919). On the other side, and at the same time, this entails a growing import of the normative implications of knowledge, its predictive capacity implying and thus imposing an order to the social world, as inextricably intertwined with the natural world deemed to be controllable (Wynne, 1992). The normative correctness of a rule is thus neatly distinguished but at the same time tightly connected with its factual soundness – that is with scientific knowledge and technical skills – and vice versa. This makes the relationship between knowledge and power a constant critical aspect of the modern social order. Today's fashionable network governance may be

different from outmoded hierarchical government, yet ‘effectiveness’ is still designated as one of its core principles (EC, 2001).

In the 20th century the modern understanding of the knowledge-power relationship takes the shape of a narrative^{viii} by which science provides a reservoir of knowledge to answer social needs, fundamental research leading to applied research and applied research to concrete social benefits. Sound science is premised to rational, efficient policy-making. This narrative, famously made explicit by Vannevar Bush (1945), makes sense of and legitimizes an increasingly tight relationship between production and use of knowledge, stemming from a knot of matching needs: the need of money of an increasingly technology-dependent science and the need of science of increasingly innovation-dependent politics and business.

In this context the antinomy surfaces first (1960s-70s) as a problem of ‘technicization of politics’, or technocracy. The opposite perspective of a ‘politicization of science’ subsequently gains relevance. Of course it is not that two formerly separate social enterprises have blurred. Indeed, as many studies in science and technology have shown, they have never (nor they could have) been totally separated. It is the antinomy that becomes socially salient in the form of the following argument: if sound policy-making presupposes sound science, then scientific debates inevitably become political debates because the conclusions of the former entail univocal answers to political conflicts (Pielke, 2007). Or vice-versa political debates become so technical that the political questions disappear. This problem increasingly fills debates at specialised level and in the public sphere. One may speculate on why the traditional narrative enters a crisis. One reason may be that the intertwining of science, politics and business becomes so tight that the disinterestedness of science, previously working as a major legitimating ground, is eventually brought into question. Another reason may lie in the growing import of the unintended side effects of technology. Related to the broadening of the pretences of control of the natural and social world, the growing saliency of uncertainty eventually brings into question the promise of effectiveness and efficiency implied in the ‘unspoken contract’ (EC, 2000b) between science and society described by the traditional narrative.

Facing the antinomy

If this is the problem, what is the solution? In principle the antinomy can be resolved only by hiding it again, that is by finding a new way to separate knowledge and power – to depoliticize science, or detechnicize politics. Three answers can be singled out in the current debate, according to how much of the original narrative is retained. A first answer is ‘business as usual’. Policies must be based on sound science and nothing else: ‘The policymakers’ maxim should be “science first”’ (Forrester and Hanekamp, 2006: 310). And sound science has nothing to do with politics. This approach fails to acknowledge that the politicization of science has become too socially salient to be dismissed as a mere deviation from the norm. As a consequence what someone calls the ‘decisionist’ approach, corresponding ‘closely to what in USA is known as the “Red Book” model’ (Millstone et al., 2004: 6), has gained growing consensus. Depoliticization of knowledge is sought by drawing a sharp distinction between a science-based risk assessment and a risk management where scientific evidence is applied according to social and political considerations. Precaution, therefore, becomes a matter of risk management ‘when scientific uncertainty precludes a full assessment of the risk’ and ‘until all the necessary scientific knowledge is available’ (EC, 2000a: 12, 7). Finally a third approach has emerged, for which no sharp distinction between risk assessment and risk management is possible. Someone calls it ‘transparent’. This approach ‘assumes that non-scientific considerations play a distinctive upstream role setting the framing assumptions that shape the ways in which risk assessments are constructed and conducted. It implies that rather than leaving those assumptions implicit, and leaving risk assessors to take responsibility for non-scientific judgements, risk managers could

provide their risk assessors with explicit upstream framing guidance. Such framing guidance could, in turn, be legitimated through normal channels of democratic accountability' (Millstone et al., 2004: 7).

There are, however, fundamentally different ways to understand this approach. Common starting point is criticism towards both the traditional and the decisionist models. Disagreement on science does not prevent consensus on action as well as agreement on science does not prevent diverging views on action (Pielke, 2007). In other words, uncertainty does not hamper decision, nor certainty makes it easier. Moreover 'uncertainty in environmental controversies is a manifestation of scientific disunity (excess of objectivity; disciplinary diversity) and political conflict' (Sarewitz, 2004: 393). It is connected with the advancement of knowledge and the deepness of political controversies, the latter being partially fuelled by the former. The higher the stakes, the higher the related uncertainties (Wynne, 1992); or, conversely, the higher the levels of certainty required to decide. Examples are manifold, from climate change to percolations of toxic-waste repositories.

At this point the argument takes different directions. Someone remarks that the goal of science is not to resolve political controversies but to broaden the range of policy alternatives, distinguishing those compatible from those incompatible with scientific data. In other words, the task of experts is to shed light to the highest possible number of policy alternatives among which policy-makers and people can choose. In other words again, 'politics helps us decide the direction to step; science helps the eyes to focus' (Sarewitz, 2004: 400). Pivotal to this position is the distinction between politics – the field of social conflict where scientists bring their own value options as any other citizen – and policy – the field of decisions on public affairs, where scientists bring objective elements for evaluation (Pielke, 2007). Accordingly, 'those who make scientific assertions in fora of public deliberation would have to accompany those claims with a statement of value preferences and private interests relevant to the dispute' (Sarewitz, 2004: 400).

In this way the transparent approach basically becomes a 'revised' version of the decisionist one. We recognize that scientific questions are framed by political ones, and that the latter affect also the sufficiency of scientific evidence for policy purposes; yet within a given political frame the policy options are independent of political opinions. One may ask, however, if such distinction is really possible without appealing to the good old 'objective facts' of the traditional model, with the related drawbacks (technicization of politics or politicization of science). This position, in other words, fails to draw the full consequences of its own premises.

The alternative route is to recognise that the social and the natural orders are really co-produced; that 'the ways in which we know and represent the world (both nature and society) are inseparable from the ways we choose to live in it' (Jasanoff, 2004: 2). To recognise, in other words, that there is a 'continual interpenetration of political choices or commitments and the production of reliable knowledge. [...] The State's instrumental goals, the knowledges and practices adopted for achieving them, and the applicable standards of credibility and legitimacy are all constructed together through a unitary process of ordering of the world' (Jasanoff, 2005: 23). This corresponds to what pragmatist philosophers had argued a long time ago: that knowing is doing and thus knowledge is dependent on the goals for which it is produced. As a consequence, for any significant level of controversy, distinguishing between politics and policy, values and facts is virtually impossible. The tighter the intermingling of science with political (and judicial) power, the more difficult and controversial the politics-policy distinction becomes. We have here a radical departure from the dominant modern narrative of knowledge and power. From this viewpoint the task is not so much to revise the social contract of science according to the novel conditions that affect its 'mode of production' (Nowotny et al., 2001). The task is to rethink it.

Precaution and the division of labour in Europe

Precaution and the European Social Model

The overlap of different accounts of the division of labour on knowledge (traditional, decisionist, revised, radical)^{ix} makes the PP issue quite entangled. The controversy on precaution expresses a growing public questioning of the traditional narrative. Such questioning, and especially the oscillation between decisionist and transparent approaches, is not unique to Europe, being observable also elsewhere – for example, as we have seen, in the US. However it has become especially salient in Europe. This is testified by the EC Communication, with its wavering between qualitative appraisal and CBA, technical assessment and public acceptability, independence of risk assessment and policy-makers' adjudication on the relevance of minority scientific opinions^x. Such wavering is reflected in the way concrete issues are addressed. One example is provided by the so-called Pfizer case^{xi}, dealing with which the European Court of First Instance has been caught in what Van Asselt and Vos (2006) call the 'uncertainty paradox': deep uncertainty is recognized but at the same time reliable and cogent scientific evidence is maintained to be at the basis of decisions, with experts required to provide certainty about uncertain risks, uncertainty reduced to contrasting opinions, and the Court acting as a 'super-expert' able to resolve scientific disputes.

The special saliency of the PP controversy puts Europe at the forefront of innovation in the governance of science and technology. Such saliency, as we have seen, can be ascribed straightforwardly neither to institutional nor to historical or cultural factors. The attractiveness of the division of labour perspective is that it points to a different direction of inquiry, according to which Europe's ambivalence towards precaution – its oscillation between reducing precaution to an extended cost-benefit analysis (Funtowicz and Strand, 2007) and taking it as a cornerstone of the new social contract of science (EC, 2000b) – should be related to some ambivalence in the conception of the social tie connecting individuals, groups, organized interests and institutions, that is in Europe's self-understanding as a society. A clue to this ambivalence is provided by the debate on the European Social Model (ESM).

The expression ESM is used since the mid 1980s and discussions have considerably grown in the 1990s and 2000s. In a general sense the narrative of the ESM outlines a picture by which the European approach to social solidarity is different from the American one. It connects economic development with social development, rather than subordinating the latter to the former. It entails a social regulation of economy, robust welfare services and social policies, a major concern for social justice – briefly, a more sustained and proactive way to understand social solidarity (EC, 2005).

This type of discursive self-representations cannot be dismissed as mere rhetoric since they are not simply the product of underlying interests but impinge upon how identities are defined and interests understood (Lucarelli, 2006). What strikes the observer is that at a closer look the narrative of the ESM shows fundamental ambivalences. It is unclear, first of all, the precise meaning of the expression. Sometimes the ESM is understood as the sharing of institutions, values and forms of regulation; other times as an ideal type underlying a variety of national models; other times again as an ongoing project aimed at fostering sustainable growth and social cohesion according to common rights and principles as stated in the Charter of Fundamental Rights (Jepsen and Serrano Pascual, 2005). Second, and crucially, each understanding hides major tensions. Who is closer to the ideal type – the UK or the Scandinavian countries? What is the balance between growth and social justice, or between state regulation, market-based policies focussed on taxes and incentives and 'third generation' approaches seeking for partnerships, persuasion, voluntary accountability (Pellizzoni, forthcoming)? Is the ESM defined by the sharing of institutions and values or by the sharing of problems (namely the pressure to competitiveness and efficiency coming from globalization and innovation)? Is the ESM a project to develop Europe according to some core principles or an attempt to adapt it to a changing world?

The basic aim of the narrative of the ESM actually seems to accommodate Europe's special commitment to welfare and solidarity to alleged global economic and technological imperatives entailing instability and competitiveness. The neologism 'flexicurity' symbolizes the ambiguous, double-edged character of this narrative, endeavouring to convey the idea that an increasing flexibility – a deregulation that from the 'margins' of the labour market (young and elderly workers, 'new jobs') should spread into its core (EC, 2006) – may expand at the same time job opportunities and social security. What remains unaddressed, however, is the possible incompatibility (first of all logical) between describing the current dynamics of innovation and globalization as something inevitable – as a matter of fact – and pretending to seek for more than pure adaptation; the possibility that elaborating or implementing the ESM may require first of all reviewing the current, largely unspoken rules of the division of labour, which allow for crucial choices related to science, technology and economy to remain undisclosed to public scrutiny thanks to their alleged ultimately benign nature and their consignment to the exclusive domain of 'dedicated' social actors.

The debate on the ESM, therefore, shows that, in front of the growing scope and pace of technological innovation and economic globalization, the latent contradiction between the multiple founding values of Europe – individualism and solidarism, private initiative and social regulation of production and use of material and immaterial resources, market competitiveness and social justice – tends to produce actual deadlocks. Europe is imagined in different ways by its citizens (Bauman, 2004). And behind the failure of the constitutional treaty lies the contrast between the idea of a Social Europe and the idea of a Laissez-Faire Europe (Gamble, 2005) – between two different ways to conceive the social tie, the rules of the division of labour. This contrast is reflected in the PP controversy. The latter actually represents a hot spot of the former, which is no surprise given the central role played by the division of labour on the production and use of knowledge in modern society. Narratives of precaution, as we have seen, imply narratives of social solidarity. And 'many imaginaries of Europe as a social and policy arena are closely connected to master narratives concerning science and technology, both shaping and being shaped by them' (Felt and Wynne, 2007: 79). The ambiguity about the model of solidarity, therefore, encompasses an ambiguity about the division of labour on the production and use of knowledge. At the same time, being at the core of the self-understanding of modern society, the latter is crucial and sheds light to the former.

The radical way to precaution: promises and perils

To sum up, the division of labour perspective suggests that the PP controversy has gained a special saliency in Europe because Europe is undecided about what type of society it aims to be, what type of balance between its founding values – what combination of laissez-faire and social review in economy, science and technology – is to be realized. As the Pfizer case shows among the others, Europe seems eager but at the same time hesitant to embrace a radical approach to precautionary regulation, because this would entail a thorough rethinking of 'the value and the role of science [...] in the regulatory process, together with the role of public authorities and courts' (Van Asselt and Vos, 2006: 332), that is wide-ranging rearrangements in the division of labour. Europe's ambivalence on precaution, in other words, depends on and reveals its ambivalence on the balance between contrasting values – its ambiguity about how a peculiar heritage of communal relationships can be safeguarded and transcended at the same time.

This, of course, is not to say that the problem of accommodating contrasting values is unique to Europe. Yet in the US such problem is presently subdued by the predominance of neo-liberal readings of the modern values of individuality. This, also, is not to say that risk-related cultural frames, institutional arrangements and regulatory failures count for nothing. Yet, as the European case indicates, what seems to lie behind them and to be ultimately at stake in the PP controversy

is precisely the question of the division of labour on knowledge.

However, if the conservative approach to precaution is likely to be unable to deal with the increasing scope of the intertwining of knowledge production and use, the radical one is far from unproblematic. A period of intense, perhaps dramatic social anomy is to be expected as a consequence of major institutional changes. This alone makes hesitations understandable. Yet it is neither the only nor necessarily the main concern. After all social anomy – often described as a decline of people's trust in science and political institutions (EC, 2000b; 2001) – is already an acknowledged consequence of the inability to face the challenges of innovation and globalization. Then, one may say, why not to try some major reform?

More insidious seem the possible perverse effects of the dismantlement of the institutionalised forms of separation between production and use of knowledge. Indeed this breakdown may lead to an expansion of the private appropriation of knowledge – its growing subjection to political power and business – rather than an expansion of its openness to public scrutiny. The more knowledge is explicitly recognised as positional, the more indistinguishable it is from power and, thus, the more power is able to label any form of knowledge-based dissent as a minority partisan stance, to be legitimately dismissed according to the rules of democracy – or the market. If all voices are by definition equal, the loudest is likely to win hands down.

Such drift is indeed already noticeable, which suggests that the perverse effects of a 'democratization' of knowledge may represent a more pressing problem than social anomy. The radical approach to the governance of science and technology is grounded on a literature committed to deconstructing the boundaries between spheres of social action. Think for example of the idea of sub-politics (Beck, 1992) or the notions of extended participation and extended facts (Funtowicz and Ravetz, 1993; De Marchi, 2003; Funtowicz and Strand, 2007). Latour (1999) argues about a sort of new constitution according to which both politics and science would take part in the definition of reality – our common world and what we want to do with it. This is more than academy. Business and political actors (and scientists themselves) increasingly recognise the positionality of scientific knowledge. They use it, however, as an argument to legitimise their own interests. In the biosciences what was once considered a discovery is increasingly defined as a patentable invention. The result is not an expansion of the public review of innovation, but of the private appropriation of the biophysical world (Heller and Eisenberg, 1998; Boyle, 2003).

As a consequence some critics of the traditional narrative of science and society are now worried about their own success. Taking again Latour as a prominent example, he has begun to express such concerns endeavouring to overcome the realists-constructionists quarrel, indeed more for its practical consequences than for its theoretical flaws (Latour, 2004). What worries him is the growing appeal to scientific uncertainty or the manufactured character of reality – or, one may add, the switch from such appeal to a plea for hard facts and sound knowledge, according to convenience – as weapons in the struggle for power and money. The pluriverse character of the knowable world, he argues, prevents from agreements on matters of fact. However it allows agreements on a 'state of affairs', that is on a common world as the outcome of practices, mediations, forms of life, engagements connecting words and things, humans and non-humans, the composition of which is entrusted to suitable yet unspecified institutions (Latour, 2003).

In fact, this is the problem with the arguments of Latour and many others: they are of little help in devising a mindful, consistent approach to regulation, one capable to address the wide-ranging implications of the 'disenchantment' of science: the delegitimation of its social image and self-description as a value-free enterprise aimed at the discovery of a sole objective truth. They stress, however, a basic point: the governance of science and technology raises multifaceted questions, the trickiness of which extends well beyond the crude alternative between conservatism and innovation.

Conclusion

As one can see, a lot of conceptual and practical work is to be carried out. Far from being a fading fashion precaution is likely to remain at the crossroad of major theoretical and regulatory questions. And this precisely for the reason that narrow accounts of the PP controversy fail to grasp: what is at stake with precaution is the basic structure of the social relations on the production and use of knowledge. In this sense the division of labour offers a promising framework for the study of risk regulation and the related controversies.

To address the ambivalences in the way precaution has been developed so far, as a concept and as a policy option, means first and foremost to address the alternative between revising and rethinking the division of labour on knowledge. Between dealing with the social contract of science independently or as part of a broader rearrangement of the social contract vis-à-vis the challenges of innovation and globalization. The precise outline of the alternative, however, is context-dependent. On the one hand the more intertwined science, politics and business result, the less adequate a reformist approach is likely to appear to the public opinion. On the other hand a wide-ranging reflection on the current division of labour – an exploration of possible novel ways to articulate the relationship between knowledge and power – requires a critical mass, social forces strong enough to put the issue on the agenda and ready to face a period of major institutional change.

The implications of the disenchantment of science, moreover, seem contradictory. ‘Democratizing’ science – as many, taking seriously precaution, ask for – does not automatically correspond to democratizing power. If the once celebrated emancipative force of science – a force crucially (but possibly misleadingly) understood as depending on its privileged relation with a sole objective truth – is increasingly denounced to be just rhetoric, it is unsure that this may actually support any effort to cut loose from domination. This question may account for many academic quarrels, social conflicts and regulatory hesitations, aside from narrowly understood interest struggles. More than Popper’s argument about science as the guarantee of an open democratic society one should perhaps bear in mind, in addressing issues of precaution, the Pragmatists’ advice about democracy being the guarantee of science as a social enterprise aimed at producing knowledge for the common good.

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Notes

ⁱ I may be unable to calculate the probability of two events, so that for me they are the same, yet this may not be the actual case, as I could discover by gathering additional information.

ⁱⁱ As it is well known, false negatives (or Type II errors) occur 'when an initial finding of no (or acceptable) harm later turns out to have been incorrect. False negatives are risked by presuming "innocent until proven guilty"'. On the other hand false positives (or Type I errors) occur 'when an initial finding of (unacceptable) harm later turns out to have been incorrect. False positives are risked by presuming "guilty until proven innocent"' (Wiener and Rogers, 2002: 321).

ⁱⁱⁱ An example is the notion of the entrepreneur's 'normal profit' or 'fair remuneration'. This notion contradicts the very idea of market as a competitive, dynamic system. However it is used to draw an unwarranted distinction between legitimate or illegitimate corporate burdens, public concerns and firms' own concerns.

^{iv} False negatives are in principle less problematic for scientists and technology developers because if something that really exists has not been detected yet it can be in future (Cranor, 1993).

^v The *social* division of labour is to be distinguished from the *technical* or *organizational* division of labour: the latter regards the different tasks related to the production of a same good; the former regards the tasks related to the production of different goods.

^{vi} Institutional isomorphism is understood as ‘a constraining process that forces one unit in a population to resemble other units that face the same set of environmental conditions’ (DiMaggio and Powell, 1983: 149).

^{vii} This interpretation finds support in the way proportionality has been defined by the ECJ (cf. Christoforou, 2004: 50, note 74).

^{viii} A narrative is a way to make sense of the world, giving salience to and logically connecting actors, institutions, events, discursive and material aspects of society (Franzosi, 2004).

^{ix} For a different but, to my reading, comparable account of the alternative models of science-policy interface, or intertwining, see Funtowicz and Strand (2007). Their ‘demarcation’ model roughly corresponds to what here is called the decisionist model; their ‘framing’ model to the revised model; and their ‘extended participation’ model to the radical model.

^x These ambivalences are not confined to the Communication on precaution but characterise the broader European approach to science and technology, where the acknowledgement of the side effects of innovation and the public’s uneasiness with its unreflective acceptance are counterpointed by the assertion that innovation as such is of paramount importance, leading to unquestionably beneficial and desirable outcomes vis-à-vis the challenges of globalization and European citizens’ growing demand of welfare and quality of life (Levidow and Marris, 2001).

^{xi} The case concerns the banning of the use of the virginiamycin antibiotic as animal growth promoter.