

## **Risk, Precaution, Responsibility and Equal Concern.**

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### **1. Introduction**

Systemic risks raise specific challenges to risk regulation. These are no-fault, non-negligence risks arising from the cumulative effects of individual legitimate actions in a complex environment. They have the particular nature of being imposed by interlinkages and interdependencies in a system and of producing cascading failures on the system itself. Interdependencies due to globalisation expose infrastructural assets to the risk of cascading failures originating from the interlinked structures of the markets and different national regulations. (Schwarcz 2008; Goldin and Mariathan 2014, 27-33)

The interconnectivity and interdependency that are typical of today's globalised society enable the networks of interests also to become networks of risks. Connectivity and interdependency on a global scale make systemic risks unavoidable, as they are embedded in the structure of connected societies and they are part and parcel of having worldwide market-based systems. For instance, the integration of markets can generate positive externalities (e.g., competition can promote the quality of products and services, interconnection can help develop essential services), but the more interdependent economies become, the higher the risk that they may fail together. The direction towards which the world is moving makes any well-informed decision to opt out and avoid systemic risks very difficult to take.

The nature of systemic risks therefore raises significant questions of compensatory justice, concerning the responsibility for both mitigation and recovery and the identification of a normatively fair and equal way to address systemic risks. This article aims to investigate what issues of fairness the regulation of systemic risks should address, by focusing on how systemic risks challenge responsibility and equal concern.

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At the core of the definition of systemic risks is the coordination of the agents and the fact that single agents' actions taken separately do not significantly change the probability of harm. So systemic risks differ from individual risks, which can be wittingly either taken or avoided according to the propensity of the single actor to the so-called moral hazard. Systemic risks identify the probability of harm deriving from the coordinated effects of individual behaviour.

By mitigating and diversifying risks a single actor decreases his probability of harm; but if many actors in the same sector do it in similar ways, their coordinated action may expose the sector itself to the possibility of multiple failures. What is good for a single actor may not be good for the system. Single actors can act with a view to mitigate at best their individual risks and nonetheless contribute to exposing themselves and other actors to systemic failures.<sup>1</sup> This shows the difference between individual risk and systemic risk: the latter is not the result of the sum of the many risks of the former kind. On the contrary, it is the result of their meaningful interaction in a complex environment.

If systemic risks are generally known to be possible, it is empirically difficult to predict cascade failures. Uncertainty plays a key role in mitigation policies based on the rational assessment and management of risk levels; i.e., probabilities, harms and effective control. When engaging in the reduction of the chance of systemic failures, regulation has to operate in an uncertain environment, where cause-effect relations between phenomena are not evident and a number of different and concurrent factors affect the material situation at stake. Uncertainty makes systemic risks powerful at the most, because they are most difficult to detect in advance and to mitigate effectively. Moreover, the impact of systemic crises can last for a generation or even more, making recovery a long process which should be taken on by individuals with adaptation and resignation.

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<sup>1</sup> This is particularly evident to the economic scholarship on systemic risk. After the global financial crisis, many proposals for financial reforms had to deal with the tension between the distribution of assets that banks want to hold and the distribution across banks that best supports the stability of the banking system. If any bank can lower its probability of failure by diversifying risks, when many banks diversify likewise, they will probably fail jointly. (Beale, Rand, Battey, Croxson, May, and Nowak 2011; Ibragimov, Jaffee, and Walden 2011) Furthermore, sometimes assets seem uncorrelated, but they can suddenly change their appearance as a result of margin requirements. (Shin 2010; Allen, Babus, Carletti 2010; Greenwald and Stiglitz 2010; Allen and Gale 2007)

The complexity of the origin of systemic risks, however, does not allow reducing the question to a pure matter of costs and benefits for single actors, but it involves further considerations about information asymmetries and uncertainty. The issue is therefore how to identify the optimal level of interaction and interconnection that does not affect the functioning of a system as a whole and, as a necessity, of its single parts. Recent studies on systemic risks show that these risks can be measured and somehow kept under control. (Acharya, Pedersen, Philippon, and Richardson 2010; Hansen 2013; Battiston, Delli Gatti, Gallegati, Greenwald, and Stiglitz 2009) Rather than only engage in alternative actions to increase expected benefit or decrease expected loss, this article considers that the nature of the problem itself should be scrutinised and responsibility issues should be pinned down.

Aaron James in this Journal has introduced a promising way of thinking about fairness and systemic risk regulation. Building upon James' distinctive contribution, this article aims to explore further the challenges to a fair distribution of systemic risk. James identifies the 'distinctive significance of systemic risk' in the collective wrongdoing, notwithstanding individually rightful action. The externality is created through cascading effects of individually right action that the risk-bearer with full information about long-term risks and anticipated benefits would have reason to reject. He thus identifies the concept of public morality in the principle of due care, interpreted as the duty to choose the less risky regulation for everyone in the collectivity, provided that the costs of the precautionary option are justifiable. According to James, the continuous imposition of risks makes social systems difficult to justify. Under the contractualist moral theory, James points out that the exposure to the risk itself is questionable and he refuses consequentialism, according to which if no harm materializes, no moral issue arises. He argues that everyone should be given the opportunity to control the exposure to risks and the expected lifetime benefits. On these grounds, responsibility should be allocated both collectively and individually. James portrays an organisation-related model of compensation, which allocates responsibilities both non-distributively to the group of agents taken collectively, and distributively to particular agents, depending on their specific position within the collectivity.

According to James, regulation cannot create risks 1) if and when these are serious; 2) alternative policies may significantly reduce risks; and 3) alternative policies are not costly for the collectivity. As a consequence, precaution should shape institutional choices and the pure aggregative cost-benefit analysis cannot be the decision-making rule, because it cannot answer moral concerns. Cost-benefit

analysis might apply only if morally driven; that is, when aggregated benefits exceed individual harm at a reasonable cost (see also James 2012a, 280-281). Good governance of systemic risks thus requires regulators to focus on how to ensure the system fairly aggregated benefits and, consequently, to decide how to diversify individual risks in order to guarantee the sustainable stability of the system. The individual level of due care should reflect the public goal of the system's fair stability and every single actor should be aware of risks in order to functionally (and also morally) contribute to their collective mitigation.

Against the backdrop of James' interpretation, this article portrays a general account of the nature of systemic risks and the regulatory challenges they raise with regard to responsibility. We argue that questions of the reversibility of the risk, individual risk preference and the general background conditions of justice of the systemic risk matter in regards to whether fairness calls for the definition of any precautionary approach to (systemic) risk regulation. We submit that the question whether more or less precaution is justifiable depends entirely on the fairness of the overall background situation and the transactional fairness of the interactions giving rise to the systemic risk. Additionally, differences in evidentiary uncertainty as to probability and levels of harm and effective responses require a normatively appropriate response in the form of additional precautions. In order to reach legitimate decisions, the relationship between law and evidence of facts is key. Our claim is that the normative force of law needs to rely on accurate factual evidence. On this ground, we develop a justification of the precautionary principle that connects it tightly to practical reasoning, which we understand here as a combination of deontological and teleological reasoning, with deontological reasoning enjoying priority. This application of the precautionary principle is not to be intended as a response to irrational fears against technological innovation (Sunstein 2005), but rather as a way of enabling technological and scientific progress in light of deontological moral constraints. We aim to show in the first instance that the sameness of evidentiary standards set for risk-based cost-benefit analysis have a connection with deontology because they express a postulate of equal treatment in formal terms.<sup>2</sup> However, systemic risks can have different possible degrees of epistemological

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<sup>2</sup> In regulation, a positive/negative risk assessment typically requires a high confidence interval of 95%. This figure expresses a 95% level of confidence that the probabilities of benefit/loss are accurate. In other words, the level of uncertainty in the accurateness of the prediction is rather low. When the confidence interval is lower, a point risk calculation is no longer as reliable and we might instead have a range of probabilities or even disconnected points or a different assessment of what the nature of the likely benefit or loss is or even a combination of both. Adler's (2012, 542-547) elaborate defence of welfare-based cost-benefit analysis with

certainty due to factors of social and natural origin, such as more available research funding or higher degrees of complexity for some systemic risks but not others. These differences have to be mitigated by allowing for even greater precautions in difficult-to-research systemic risks.

**2. Do all systemic risks raise *ex ante* precautionary and regulatory concerns of distributive fairness of risk or *ex post* concerns of fairness?**

As we have argued in the introduction, systemic risks are extraordinarily complex and also come in many different guises. We can distinguish amongst systemic risks based on whether their consequences are reversible and whether the expected losses and benefits are of the same or a different nature. We want to argue that it is not the case that inequalities in risk distribution raise a fairness concern across all these different types of systemic risks.

The first type of systemic risk can (i) give rise to reversible expected hazards and (ii) expected hazards and expected benefits are within the same dimension. Financial risks can be an example of this type of systemic risk. Let us assume that the negative psychological consequences of job losses due to financial crises are not at issue because the society provides for effective employment reintegration assistance schemes, allowing everyone who lost a job to find one that is equally satisfactory. The unit of expected loss and benefit is then exactly the same: money. The hazard, once it materialises, is also perfectly reversible because it just requires a financial transfer. By implication, the cost of precaution is also measured in the same dimension. The inequality in risk distribution of financial market risks is palpable because institutional investors with sophisticated knowledge and large assets will be much better able to avoid the hazards of financial crises than unsophisticated individual investors such as a “Working Class Joe”.

A second type of systemic risk can (i) give rise to irreversible expected hazards and (ii) involve expected hazards and expected benefits in the same dimension of measurement. Kamm’s ambulance speeding case is a good example of this type of risk.<sup>3</sup> In his ambulance case, expected hazards and benefits are

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sensitivity to unequal distribution in expected losses/benefits acknowledges this problem but it ultimately fails to offer any solution to it.

<sup>3</sup> Kamm (2007, 29-30 and 274-5.) distinguishes two cases: Ambulance I and Ambulance II. In Ambulance I, we are faced with the question of allowing ambulances to speed to save five lives even though we know statistically that

measured in terms of lives lost/saved. By implication, the cost of precaution (speeding limits for ambulances) is also measured in the same dimension. The inequality in risk distribution arises because those living next to hospitals have a higher risk of being run over and a lower expectation that the ambulance speeding is material to their survival as a patient since they live close-by anyway.

A third type of systemic risk can (i) give rise to irreversible expected hazards but (ii) involve expected hazards and expected benefits in very different dimensions. Extreme and deadly weather events caused by greenhouse gas emission activities leading to climate change would be an example where loss is irreversible and occurs along the dimension of lives lost, while expected benefits from the systemic risk created by greenhouse gas emissions are manifold and can range from economic development to better healthcare, mobility, high-protein meat-based nutrition etc. The cost of taking precautions will then also be multi-dimensional. The inequality in distribution of the risk (and costs) arises due to different socio-geographic factors that make populations more vulnerable to extreme weather events and others more dependent on fossil fuels for attaining or preserving a decent living standard.

A fourth type of systemic risk can (i) give rise to reversible expected hazards but (ii) involve expected hazards and expected benefits in very different dimensions of measurement. Let us assume for the sake of argument that the only risk of climate change is a risk to populations in low-lying island states that their polity organised on a specific territory will disappear with expected benefits, costs of precaution and determining factors for inequality being the same as in the third example. The risk of polities organised on specific territories being wiped out by rising sea levels seems reversible insofar as a displaced population could be offered territory of another state in which it can re-establish sovereign rule and financial compensation for the cost of re-establishing its own institutions, building infrastructure etc.

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an unlucky passerby will get killed. Ambulance II does not concern generally applicable speeding limits for ambulances but rather the question whether the ambulance's driver should break in the instant case where it would otherwise hit the unlucky passerby. Arguably, ambulance II is not a situation of systemic risk anymore because the likely victim is now known and therefore does not concern us here.

It is not clear why we should worry about inequalities in the distribution in risk and the availability of reasonably costly precautions as a matter of fairness at all in the first example. An *ex post* rectification of the damage done to “Working Class Joe” and similar people is perfectly possible on the basis of financial compensation. As long as it happens and small-scale investors can enforce such rights were a financial crisis to happen, *the mere imposition of risk* during the years preceding the crisis does not wrong “Working Class Joe” and similar people.<sup>4</sup> Indeed, whether a society opts for mitigating the risk or prefers to clean-up after a crisis seems only to be a question of cost, prudence and risk preference, but not of justice. Perhaps waiting for the damage to happen and cleaning up afterwards is less costly than adopting precautionary regulation of the risk; perhaps not adopting the precautionary regulation of the risk is imprudent because costs could turn out to be higher than expected once the damage of a financial crisis is done.

Similarly, the fourth case for which we assumed for the sake of argument that the risk of climate change is limited to territorial displacement and potential statelessness seems to be a case where the wrong arises from the lack of compensatory mechanisms and not from the mere imposition of the risk.

Inequality in risk imposition is therefore of concern only in those cases in which the damage linked to the risk is irreversible. It is then perhaps not by coincidence that the most prominent formulation of the precautionary principle in international law limits its applicability to cases of suspected serious and irreversible harm.<sup>5</sup>

We now focus on how to adjust the expected benefit/loss ratio. Note that two cases are possible here: a positive risk (benefit) and a negative risk (loss), with a risk being the probability of the benefit or the loss occurring. This gives us at least four options: we can increase the probability of the benefit, we can augment the value of the benefit, we can decrease the probability of the loss and we can reduce

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<sup>4</sup> This does not imply that the *results* of unequal imposition of risk of financial crises which reflect themselves in different levels of financial gain could not become a concern for fairness if they lead to unacceptable socio-economic inequalities amongst citizens, endangering, for example, their status as members of a polity with equal participatory rights. This is, however, a different issue from the concern with the fairness or unfairness of inequalities in the imposition of risk.

<sup>5</sup> Principle 15 of the Rio Declaration states that “[w]here there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation.”

the severity of the loss. All four options can lead to a favourable ratio of expected benefits over losses, but are they equally just?

We would query this. Would it really be just towards “Working Class Joe”, who sees his lifetime earnings wiped out during the 2008 economic crisis, that the probabilities were adjusted (either on the benefit side or on the loss side) and that he just happened to be the unlucky one who got hit statistically if the consequences for him continue to be dire? Or would it really be just towards “Working Class Joe”, who faced a 1% chance of losing 200,000 over the next 20 years relative to a 0.5% chance of gaining 300,000 over the next 20 years, that he has an expectation of receiving 2500 per year in compensation for the excess risk of loss over the next 20 years if he loses 200,000 two years down the line?

“Working Class Joe” is like the unlucky victims who will statistically die in a car accident in the beneficial practice of car driving in which everyone has the same *ex ante* prospects. But why is it enough by way of justice towards the unlucky ones to know that they were not systemically at risk (in the sense that their expected losses foreseeably exceeded their benefits) but only statistically? Why not also pay “Working Class Joe” (and perhaps the families of the unlucky car accident victims) something for the fact that they ended up being the ones who bore the cost for the collectively beneficial practice, since but for the statistical sacrifice of some, the socially beneficial practice would not be possible? Why not, to take a cue from James’ earlier work, distribute the benefits and burdens of the social practice more fairly *post hoc* and take some of the additional surplus created through capitalist economies or traffic from the lucky ones (James, 2005, 543; 2012b, 221-6) over and above even an equal distribution of prospects *ex ante*? A similar argument is made by Keating (2003, 743-6) in respect of compensable tort injuries. And indeed why only require that the practice of systemic risk imposition be overall beneficial for everyone without looking at whether *relative levels* of benefit and loss are also equal (Adler, 2012, 501-4), or, if not equal, justified because the inequality is necessary to increase the prospects of the least well-off risk bearer (Keating, 2993, 679-80, 731, 739)? We consider this more plausible in cases where there is no intervening element of individual responsibility for increased vulnerability.

### **3. The unfairness of systemic risks is contingent upon the unfairness of the general background conditions of the risk**



Another key question that an account of fair risk distribution needs to respond to is the relationship between the fairness of risk distribution, on the one hand, and the general background conditions of the polity collectively organised and rule-regulated interaction, on the other. By general background conditions, we understand the interdependent way in which a polity and other rule-regulated interaction protects basic rights and keeps at bay inequalities through measures of egalitarian redistribution. We submit that the unfairness of the general background conditions is a necessary element that turns into an issue of unfairness the lack of precaution in the mitigation of systemic risks and the avoidable unequal levels of expected benefit and loss amongst risk-bearers. If this is true, two potential avenues of addressing the unfairness open up: firstly, the regulation of the general background conditions to ensure their fairness; secondly, the regulation of the systemic imposition of risk to ensure its fairness. We would like to suggest that the two are not equal options from the perspective of fairness and that the primary political obligation should lie in the regulation of the general background conditions and not in fixing systemic risks. In this sense, fairness-based regulation of systemic risk is only a second best that we have reason to endorse in a non-ideal context in which the primary obligation is not or cannot be fulfilled.

One can use the example of people investing in the stock market in order to obtain a top-up on their state pension; assume that the state provides a very decent level of pensions and that the risk of the particular investments on the stock market is well known but that levels of risk and benefit are unequally distributed. Why should it be a problem of distributive justice if the individual investors accept the risk and the unequal distribution in full knowledge of their existence and are not forced to invest on the stock market in order to obtain a decent pension? Perhaps the individual investors even rejected a less risky investment with a more even distribution of risks and benefits because the expected levels of return on this investment are lower. Is this type of situation not rather a private gamble based on a particular preference for risky activities, much like a skydiver who has a preference for risky sports which she voluntarily accepts? Is it not therefore just that the investors suffer the consequence of this voluntary decision and have they not been treated fairly by being able to engage in the riskier and lower investment they desired in the first place?

Under a different scenario, assume that the state does not provide for a decent level of pensions. Individuals are therefore forced to invest on the stock market in order to ensure a top-up level on their low state-derived pension. Assume that the risks of the investment are unequally distributed. Certain types of investors are able to reduce the level of risk significantly below the level of expected benefits, while the ordinary investors are not able to do so and therefore have to bear a higher level of risk to expected benefit. A safer alternative is however available in which levels of benefit would be lower for everyone compared to the levels of risks and through which everyone would still be able to obtain a top-up level of income on the state pension sufficient to be able to lead a decent life. This solution would be a reasonably available precautionary measure according to James and should be taken in order to ensure that the systemic risk imposed is fair.

But is this solution really enough to ensure fairness, where another option could simply be to remove much of the systemic risk being borne by individual investors by the state increasing the level of the pension and obviating the need for individuals to invest on the stock market at all to ensure themselves a decent pension? The question therefore is how far we have to go back to the general background conditions of the relevant polity or rule-regulated interaction and ensure their fairness before we can truly say that a systemic risk is fairly imposed.

The rightfulness of systemic risk imposition therefore also has to be judged against the rightfulness of the general background conditions (similarly, Keating 2003, 663, 736, 738-41). Particularly in cases where institutionalizations of very basic rights guarantees are lacking, (as is the case for many transnational situations), systemic risk imposition can be wrongful over and above the lack of sufficiently equal expected benefits relative to expected losses and the taking of preventive measures without any serious cost from the loss of the practice to anyone in particular.

If it is true that the fairness of the general background conditions must first be ensured, however, systemic risks with unequal distributions in levels of risk and benefit would presumptively be fair as long as no-one has to run the systemic risk to attain and enjoy levels of freedom, rights are protected and the state or other governing institution of a rule-regulated interaction also ensures that the risk bearers have all the necessary information to understand the risk and its unequal distribution. This also implies that the concern with the distributive fairness of the imposition of systemic risk is premised

on the failure of the polity or rule-regulated interaction to provide for generally fair background conditions and to regulate to ensure that the population is adequately informed about levels and distribution of systemic risk.

#### **4. Normative complications with the assessment of expected benefits and expected costs of systemic risks and precautionary alternatives**

The previous paragraphs have suggested that concerns with the fairness of distribution of expected costs and benefits may in reality have more to do with concerns about the fairness of the general background conditions of a polity or other rule-regulated interaction and the kind of regulation required to create transactional fairness between contractors with information asymmetries. A related issue is to consider which prior baseline is appropriate in order to evaluate expected costs and benefits of a systemic risk to ensure fairness. Is the actual situation that pre-exists the creation of the systemic risk the relevant baseline situation against which to measure what levels of expected benefits and risks a systemic risk yields? Or are we to take account of historic unmitigated injustices and remove them in order to derive the baseline situation against which levels of costs and benefits are to be assessed?

The example of the systemic risk of climate change provides a topical illustration. If the factual situation prior to the first negative impacts of carbon-dioxide on the global climate was the relevant baseline situation, absolutely speaking, small increases in economic growth through carbon-emitting economic activities would create disproportionately large benefits for developing countries and would weigh heavily in the calculation of the acceptability of taking precautionary mitigation measures that generate lower levels of expected benefits. However, one reason why the carbon-related growth counts so much in the calculation of levels of benefits is because of the historic deprivation and lack of development of these countries through colonialism. The other reason why developing countries derive large gains from carbon-emitting economic activities lies in the historic carbon-dependency of the economy. This carbon-dependency has allowed quick economic growth of developed countries and the accumulation of capital, wealth, technology, resources, knowledge, and skills from which they still derive current benefits. The question therefore arising is whether levels of expected benefits and costs should be taken at their face value or would have to be adjusted to take into account underserved

factors and factual contingencies in the calculation of expected costs and benefits of systemic risks and precautionary mitigation.

What we would therefore like to suggest is that the egalitarian requirement of precautionary action, pursuant to which expected benefits should exceed expected losses for every risk bearer, is an ideal theory where the risk bearers are otherwise equal. In any real-life situation in which the systemic risk results from historic contingencies, wrongs or morally arbitrary inequalities, the egalitarian requirement that expected benefits should consistently exceed expected costs for every risk bearer may have to be departed from. Any normative proposal for fairness in the distribution of systemic risks must therefore make clear whether it seeks to elucidate the ideal-theory conditions for fairness or seeks to make an applied contribution for the non-ideal real world.

The factual complexity of systemic risks creates additional normative complications in the calculation of equality of expected benefits and costs as the evaluative benchmark for a fair distribution of systemic risk. As we have pointed out in the introduction, the causal factors of systemic risks are often highly complex, can interact in non-linear, less predictable ways and the assessment of the further consequences of a systemic risk can also be extraordinarily complex. As a result, the factual assessment of systemic risks is often characterised by high degrees of uncertainty.

However, degrees of uncertainty and complexity vary between systemic risks and will often tend to be lower for mono-dimensional risks compared to more multi-dimensional risks. A complex risk such as climate change can involve epistemic uncertainties in relation to difficulties of current natural scientific knowledge in predicting the effects of carbon dioxide in the atmosphere, difficulties in assessing and evaluating socio-economic consequences of climate change, such as its effects on political stability, migration and job opportunities, and difficulties combining the assessment of various dimensions and disciplines into an epistemologically valid multi-risk assessment. Note that the source of the epistemological uncertainty can be of natural or of social origin but that both are morally arbitrary for risk-bearers insofar as the risk bearers have not voluntarily chosen them.

In case of financial systemic risks, a developed-knowledge industry is moreover available to assess the risk, which is constitutively necessary for the creation of the risk in the first place, because it has led to

the development of ever-more sophisticated financial instruments whose control has become difficult and it has derived gains from this knowledge allowing it to develop even further. In comparison to this, other domains of knowledge may be considerably less developed because fewer financial incentives reward the creation of this knowledge (for instance, knowledge about the human consequences of climate change-induced migration).

This difference in financial rewards is a social source of differences in knowledge and it affects the certainty with which levels of expected benefits and costs can be calculated across different types of risk. Typically, uncertainties lead to a further discount in the value of the hazard (or benefit) being calculated, compared to situations with higher levels of certainty and epistemologically- valid risk assessments where the value of the hazard is discounted only by its probability of less than 100% and not additional discounts due to uncertainty.

Those who bear more complex systemic risks are therefore worse-off compared to those who bear less complex systemic risks. Additionally, the risk bearers of a systemic risk which is poverty-related are worse-off than risk bearers of a systemic risk which is wealth-related because the more money is involved in a particular type of systemic risk, the more knowledge about the assessment of expected costs and benefits will tend to be available. These differences between risk bearers in different situations are morally arbitrary and should be mitigated with greater precautions for risk bearers subject to systemic risks which are poverty-related. We now expound arguments for why differences in the amount of epistemologically validated knowledge raise concerns about deontological fairness.

Law involves authoritative normative judgment about certain empirical states of affairs. This gives rise to questions of law and evidence, i.e., the question of what the law is, which facts have been obtained and whether the facts can be subsumed under a specific legal norm (in case the norm is a rule). Inasmuch as the normativity of law is tightly connected to displaying and enabling equal concern of moral agents living together, our claim is that the law must also rely on a correct factual basis in order to reach legal conclusions. If this is not consistently the case, the law would treat legal subjects unequally across different situations. As a result, the law's normative force would be threatened because it could no longer meet with the reasonable hypothetical assent of the people it coerces if it treats them unequally. We can thus conclude that the need to get the facts right is not only about

fostering some instrumental rationality (e.g., law should promote efficiency), but it is inherently intertwined with the normative force of law. There is thus a connection between equality and the requirement to 'get the facts right'. This connection points towards the application of evidentiary requirements (the quantum of proof) that ensure correct factual results across the most situations. From an epistemological perspective, direct experimental validation is generally considered to enjoy the highest degree of scientific validation.

However, this conception of equal treatment is only one of formally equal treatment. It cannot explain the intuition turned into positive law through the precautionary principle that lawmakers should sometimes be able to regulate, even if there is not yet scientific certainty on the probability of harm. It also ignores further differences relevant to setting the quantum of proof. The purely formal conception is insensitive to differences in the ability to demonstrate risk for certain pathways or types of harm. For example, ecosystem effects or interactions between several agents are often more difficult for experts to establish than standard toxicology risks for which well-established protocols for scientific experiments exist. Some risks are also better researched than others because there is more gain or funding. Since these factors are outside of the control of the risk bearer (and sometimes the risk imposer) and are morally arbitrary but affect the level of protection possible, they would be a source of impermissible unequal treatment if those risks were held to the same quantum of proof as well-researched risks.

With respect to the quantum of proof, the formal conception is also insensitive towards the more individualized situation, such as how the risk is imposed and distributed, what other harms ensue and who else is affected besides the principal risk bearer. Experts also do make mistakes in their assessments. Two considerations follow for a deontological account of risk regulation.

Firstly, a formalized, scientific risk assessment is not necessarily representative of individual risks faced. Consider this example: Toxicologists generally have high confidence in their ability to assess risk from food additives using animal studies. However, it seems that the vulnerability to cancer and certain other diseases is affected by one's blood group. If this is suspected but not (yet) possible to prove experimentally to result in a higher probability of those diseases, equal concern would require us to

account for the absence of the best available evidence through extra margins of safety because we must reckon with the possibility that this suspected connection could turn out to be true.

Secondly, the harm of wrong decisions, that is the *post factum* suspected alternative outcome B should our risk calculus with outcome A be wrong, could be more serious in one than in other situations. For instance, outcome B might involve a high amount of pain and psychological suffering prior to death or early death, compared to just death under outcome A. In one situation, there may also be additional innocent victims who all bear different consequences than in another situation. Multi-dimensional risks are difficult, maybe even impossible, to be modelled experimentally and if their causal factors are not neatly connected, cannot be expressed simply through additive probabilities. In that sense then, a risk of death may be comparable along some dimension but not necessarily *all* dimensions, which complicates the individualized *ex ante* characterization of expected benefits and losses.

Clearly, however, possible error scenarios are relevant from the perspective of equal treatment because they reasonably distinguish one-dimensional risk from multi-dimensional risk involving crucial human interests. The typical focus on one risk assessed under experimental modelling conditions can be too narrow for assessing the dimension along which risk bearers should be treated equally. *Ex ante* analysis of expected benefits and losses can thus be the starting point in the consideration of how to regulate risks fairly, but not an empirical shutter always blocking normative considerations based on weaker, yet minimally plausible empirical evidence.

Several consequences follow. Firstly, consistent with the idea of substantively equal treatment, the range of expertise considered needs to be expanded to take account of these qualitative differences between risks inasmuch as they pertain to key human interests. For the characterization of risk, factual evidence related to, for instance, psychological suffering, degrees of pain, likelihood of death, and ability to prove the risk depending on hazard-type, also need to be considered.

Secondly, the legally required quantum of proof has to take account of qualitative differences in risk beyond the full control of the risk bearer and risk imposer. In cases where further morally arbitrary factors are present, policy-makers may - for reasons of substantively equal treatment - rely on evidence that does not yet enjoy the highest degree of scientific epistemological validation *even if* an

experimental assessment of risk exists. The evidence must still be of a sufficient epistemic quality to enjoy relevance in the scientific community in order not to defeat completely the first claim from equality based on the recognition that direct experiments usually provide the best access to facts. What we have stated here resonates with the most common element in the different legal instantiations of the precautionary principle: a lack of full scientific certainty shall not be used as a reason not to take action against suspected but unconfirmed risks. We can thus conclude that the precautionary principle is an evidentiary principle in that it acknowledges the limits of formalized risk assessment, but is primarily a deontological one that is linked to equal treatment, which also shows us why questions of evidence in law remain normative questions.

Lastly, we would like to shed light on the question of how this understanding of the precautionary principle is linked to practical reasoning and the counterintuitive suggestion that it is technology-enabling rather than technology-disabling. By calling for additional margins of safety in case of difficult-to-research risks or finer-grained differences in risk than a typical, formal risk assessment would reveal, the precautionary principle makes it possible to go forward with technological innovation that is deemed useful, while respecting the constraints of deontological moral reasoning. Rather than banning potentially, but as yet unconfirmed risky activities outright until we have full knowledge, the precautionary principle accepts that technological innovation with potential but as yet unconfirmed risks and benefits can go ahead, provided corresponding margins of safety are built in. It is in exactly this way that the precautionary principle is technology-enabling, notwithstanding the demands of deontological morality.

## **5. Conclusion**

We have emphasized that systemic risks often come about as a result of close interconnection, including between multiple different aspects, which gives rise to a potential for instability if a tipping-point is reached. This multi-dimensional nature makes systemic risks difficult to assess regarding individual levels of expected benefit/loss *ex ante* while regulators may well be expected to avoid instability. However, some systemic risks are not as complex in nature and create reversible risks. We have argued that these types of risk do not raise *ex ante* concerns with distributive fairness and precaution but can be fully taken care of through *ex post* compensatory justice. We have exposed that James' account leaves open the question of whether expected benefits/losses of systemic ought to be



assessed based on actual baselines but for the systemic risk or hypothetical ones. In the last section, we have shown that the precautionary principle can be seen as an expression of equal moral concern in reasoning about factual evidence for the assessment of hazards. Our reflections there show that James' conceptualization of the wrongfulness of systemic risk imposition in terms of expected benefits/loss itself gives rise to a further justificatory normative question of how we ought to establish those benefits/losses given that that some systemic risks are characterized by greater uncertainties than others. What we have argued throughout this article is that multi-dimensional systemic risks raise the greatest concern with fairness and are most appropriately regulated by a conception of Due Care; as James proposes, if the unfairness of the general background conditions of the systemic risk warrants this because we are faced with a non-ideal situation.

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