

Strategizing in an Unpredictable Climate: Exploring Corporate Strategies to Cope with Regulatory Uncertainty

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Government regulation of business activities is increasing rapidly, exposing firms to considerable uncertainty and requiring managers to decide on appropriate strategic postures. To help managers make informed decisions, this study compiles a comprehensive overview of strategies to cope with regulatory uncertainty and illustrates their interdependencies and how they can be combined into overall coping postures, as well as offering management guidelines on deciding which to adopt. A literature review identifies a considerable variety of coping strategies, and we apply unique data from a worldwide cross-industry survey to categorize each into one of three types – offensive, defensive or passive. We find that firms aiming to cope with the uncertainty associated with post-Kyoto regulation typically adopt one of four strategic postures, each characterized by a specific combination of these types: ‘daredevils’ rely solely on offensive strategies; ‘coordinators’ combine them with defensive ones, ‘hedgers’ pursue strategies from all three categories while ‘gamblers’ choose not to specifically cope with uncertainty at all. We exemplify the strategies characteristic of each posture, and illustrate their interdependencies by means of case studies in the European airline industry. We identify two main factors managers should consider particularly when deciding on their firm’s strategic posture: the level of regulatory uncertainty they perceive and the firm’s exposure to future regulations, and find that the higher the level of uncertainty, the broader the range of strategies applied, and the more future regulation seems likely to affect a firm, the more actively it seeks to cope with the associated uncertainty.

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Introduction

In late 2008, the subprime mortgage crisis in the United States escalated into a global economic shock that led to the collapse of major financial institutions around the world. Many economists and policymakers have ascribed these events to regulatory failures, calling for the restructuring of financial firms' business models and stricter control of international financial markets. In response, at a quickly summoned meeting, the world's largest economies adopted an agreement on stricter regulation of the financial sector. However, this raised more questions than it actually answered - in particular, its vagueness left financial firms with high levels of uncertainty regarding the design of any new regulations, how they might be translated into national legislation, and what might be the resulting impact on their strategies, business portfolios and organizational structures.¹

Almost 20 years earlier, another global crisis requiring a concerted international response had become evident. In 1990, the Intergovernmental Panel on Climate Change had linked global warming to anthropogenic greenhouse gas (GHG) emissions, triggering several rounds of international negotiations that eventually cumulated in the adoption of the Kyoto Protocol in 1997. Although this regulation set clear GHG reduction targets for most industrialized countries, policymakers left many regulatory issues open, explicitly referring their resolution to subsequent negotiations. Obviously, this approach created high regulatory uncertainty for firms, especially with respect to the implementation of the Protocol in their countries and thus its impact on their business.

These examples have two fundamental aspects in common. First, policymakers' decisions to establish new regulation that aimed at intervening into firms' traditional business operations posed a considerable risk for these firms. Second, it exposed them to high regulatory uncertainty. In more general terms, increasing international regulation for trade, social, and natural environmental purposes exposes firms to continuous uncertainty, so that, more than ever, coping with this uncertainty constituted a fundamental challenge for them.²

One way for firms to manage political risks and reduce the transaction costs associated with an uncertain policy environment is to participate in the policy process themselves, with the aim of influencing policymakers. Such political activity is typically an integral part of firms' strategies, and abundant research has addressed its antecedents, types and outcomes.³ While this research has largely focused to date on domestic policy, scholars have increasingly begun to address firms' political activities in an international context.⁴ Results suggest that coping with regulatory uncertainty by exerting influence on policymakers is considerably more difficult for foreign firms, which typically lack the established relationships and the legitimacy of local competitors and commonly complement their political activities with other coping strategies, such as imitative behavior or a sequential market entry.⁵

Combining individual strategies into an appropriate overall strategic posture is a complex challenge for managers. There is abundant research that reflects the critical effect of uncertainty on corporate activities by addressing individual strategies. Typically, however, such research studies only consider how single strategies are used to address a number of uncertainties, often limiting the context to a single industry (or even a single region).⁶ In contrast, research that examines these problems from a converse stance - i.e., by investigating the full range of possible strategies available to deal with one particular type of uncertainty across several industries and regions - remains surprisingly limited.⁷ So managers have been given little broad guidance as to how to cope with regulatory uncertainty in general. But, as we note above, the increasing incidence of global, cross-sector regulation makes it imperative that managers be in a position to make informed decisions about which strategic posture they should adopt to address this uncertainty effectively.

Increasing global, cross-sector regulation makes it imperative managers can make informed decisions about strategic postures to address uncertainty effectively.

The object of our study is to enhance managers' understanding of how to cope with regulatory uncertainty in a broader context. In particular, we ask how they can combine individual coping strategies into an overall strategic posture that enables them to manage such uncertainty more effectively. To address this question, we compile a comprehensive overview of general coping strategies from the management literature, and categorize them based on how firms have applied them in dealing with the uncertainty associated with the threat of post-Kyoto regulatory change. This approach yields categories that denote firms' primary stances toward uncertainty, such as active counteraction or passive toleration. From combinations of these categories we then derive overall strategic postures, which we illustrate with case examples from the European airline industry, a sector facing particular post-Kyoto uncertainty. We also identify firm-specific characteristics that we suggest managers should consider when deciding which posture to adopt, and develop a framework for guiding them in these decisions. We conclude by discussing our findings and highlighting their implications for managers and academics.

Strategies to cope with uncertainty

Although the management literature offers a large variety of individual strategies to cope with general uncertainty, studies that offer managers a comprehensive overview of this field are scarce, and there are few broad typologies that structure these strategies into more generic types. Figure 1 describes the 13 different strategies we have identified from the literature and shows how these few previous studies have grouped them into broader typologies. The figure shows that these previous studies have examined subsets of eight of these strategies, but omitted the other five: in this study, we examine all 13.

Three main groups of strategies to cope with uncertainty emerge from a comparison of existing typologies in the literature, which are separated by dashed lines in the figure, and consist respectively of strategies 1; strategies 2-4; and strategies 5-8. The fourth 'group' (strategies 9-13) are those strategies omitted from the typologies currently existing in the literature. The first group sees uncertainty as typically associated with a lack of information, so that 'coping strategies' revolve around reducing the uncertainty by using *investigation* to collect missing information or to apply forecasting techniques.⁸

The second group involves firms coping with uncertainty by addressing its constituent factors. In particular, firms can *influence* the conditions that lead to uncertainty in their environment by, for example, persuading policymakers to make regulation more predictable or, on the contrary, to deliberately stimulate uncertainty in order to benefit from the firm having a better coping capacity than its competitors. Conversely, firms can obviate the uncertainty arising from highly volatile environmental conditions by *stabilizing* these conditions - for example, by only accepting payments in hard currencies to avoid exchange rate fluctuations. Firms can also pursue vertical *integration* so as to, for instance, control uncertainty caused by suppliers.⁹

The third group illustrates firms coping with uncertainty by developing resilience to endure the effects of unpredicted events that they cannot control. Specifically, firms can increase their adaptability to uncertain changes by developing their *flexibility* to prepare for multiple outcomes, perhaps via product or geographical diversification. Similarly, the decentralization and lower formalization typically associated with a modular *internal design* can facilitate firms' continuous adaptation to uncertain market developments, as well as enabling them to react more quickly to the opportunities that arise when the uncertainty is resolved. Firms can also *postpone* decisions and wait until they have greater clarity to avoid the strategic errors of making decisions on inaccurate or incomplete information, or make *no-regret moves* that will be advantageous regardless of how an uncertainty resolves.¹⁰

As well as these established groupings, we have identified from the management literature five additional strategies to cope with uncertainty omitted by these existing typologies. For instance, instead of postponing uncertain decisions firms can act early by *substituting* uncertain decision criteria with their own assumptions, thereby focusing on the particular outcome they consider most likely. Alternatively, firms can respond to uncertainty by means of *simplification*, for example by subdividing an uncertain environment into autonomous units so as to concentrate its uncertain aspects into smaller dimensions. Another option is for firms to respond to uncertainty by

No.	Strategy	Description	Underlying concepts in the literature	Typologies in the literature
1	Investigation	Collect additional information; draw on professional expertise to be applied in decision making	<ul style="list-style-type: none"> • Prediction (Mascarenhas, 1982) • Internal/External uncertainty reduction (Jauch and Kraft, 1986) 	<ul style="list-style-type: none"> • Information (Hickson et al., 1971) • Technocratic (Allaire and Firsirotu, 1989)
2	Influencing	Manipulate determining circumstances or actors that constitute uncertainty	<ul style="list-style-type: none"> • Control (Miller, 1992) • External uncertainty stimulation (Jauch and Kraft, 1986) 	<ul style="list-style-type: none"> • Shape (Courtney et al., 1997) • Power (Allaire and Firsirotu, 1989) • Prevention (Hickson et al., 1971)
3	Stabilization	Implement standard procedures or establish long-term contracts	<ul style="list-style-type: none"> • Avoidance (Mascarenhas, 1982) 	
4	Integration	Restructure business portfolio through divestitures, acquisitions, and mergers	<ul style="list-style-type: none"> • Control (Mascarenhas, 1982) 	
5	Flexibility	Enlarge range of strategic options to increase adaptability	<ul style="list-style-type: none"> • Flexibility (Mascarenhas, 1982; Miller, 1992; Wernerfelt and Karnani, 1987) • Insurance (Collis, 1992) 	
6	Internal design	Change organizational design by establishing modular structures, low degree of formalization, or decentralization	<ul style="list-style-type: none"> • Internal uncertainty stimulation (Jauch and Kraft, 1986) • Opportunistic (Collis, 1992) 	<ul style="list-style-type: none"> • Absorption (Hickson et al., 1971) • Structural (Allaire and Firsirotu, 1989) • Adapt (Courtney et al., 1997) • Reserve the right to play (Courtney et al., 1997)
7	Postponement	Defer decisions and wait for more certainty	<ul style="list-style-type: none"> • Avoidance (Miller, 1992) • Wait (Wernerfelt and Karnani, 1987) • Incremental (Collis, 1992) 	
8	No-regret moves	Execute activities that are advantageous regardless of how uncertainty resolves	<ul style="list-style-type: none"> • No-regret moves (Courtney et al., 1997) 	
9	Substitution	Replace uncertain decision criteria with assumptions derived from comprehensive consideration or detailed analysis	<ul style="list-style-type: none"> • Focus (Wernerfelt and Karnani, 1987) • Dedicated (Collis, 1992) 	
10	Simplification	Reduce number of uncertain factors considered in decision making	<ul style="list-style-type: none"> • Trivialization (Emery, 1967) • Simplification (Levinthal and March, 1993) 	
11	Cooperation	Collaborate with suppliers, customers, or competitors, e.g., in research or production; engage in trade associations	<ul style="list-style-type: none"> • Cooperation (Miller, 1992) 	
12	Imitation	Examine and copy strategy of competitors	<ul style="list-style-type: none"> • Imitation (Miller, 1992) 	
13	Withdrawal	Exit business in uncertain markets and focus on predictable environments	<ul style="list-style-type: none"> • Avoidance (Miller, 1992) 	

Figure 1. Strategies to cope with uncertainty

establish *cooperation*, engaging in long-term agreements or joint ventures - especially with firms facing the same or a similar uncertainty - to spread the risks of the uncertainty across a broader base of partners. If such partners are unwilling, or unavailable, firms uncertain as to how to act can *imitate* the strategies of their peers, or simply *withdraw* from uncertain markets to entirely avoid uncertainty.¹¹

Uncertainty regarding climate change regulation

We investigated firms' strategies to cope with regulatory uncertainty by conducting a survey to study firms' responses to the uncertainty associated with emission reduction regulation stemming from the Kyoto Protocol. The climate change context is particularly interesting, as it promises to have major implications for firms across many industries, who will assign high strategic priority to responding effectively to emission reduction regulation because of its considerable potential effect on their competitiveness. International talks on a successor regulation to the Kyoto Protocol (which expires in 2012) have been under way since 2005, provisionally culminating in the adoption of a roadmap for establishing such a regulation beyond 2012.¹²

It remains unclear what a post-Kyoto regulation would look like...so the impact [national] policies might have remains largely unknowable.

However, the controversial attitudes of the countries setting the international agenda regarding post-Kyoto regulation, and the cumbersome political processes likely to be involved in reaching any agreement, expose firms to very high uncertainty.¹³ First, it is doubtful whether a global agreement can be reached at all, as three of the world's top five GHG emitters (the U.S., China and India) are still reluctant to join in.¹⁴ Second, it remains unclear what a post-Kyoto regulation would look like and how individual countries would then design their national regulations to accord with it. Numerous policy options exist, including market-based approaches such as the European Union Emission Trading System, the imposition of taxes on GHG emissions, or the establishment of benchmark energy efficiency targets for particular products.¹⁵ Not only do these options differ considerably in terms of their requirements and the complexity of their implementation, but each of them is subject to further uncertainty regarding their specific design details. Naturally enough, these levels of uncertainty mean the impact regulatory policies might have on the industries and companies involved remains largely unknowable. In particular, the costs these policies might impose, and the resulting effects on competitiveness are largely unquantifiable, especially considering their likely variations once translated into different national regimes.¹⁶

We chose the European airline industry as our particular research context, and illustrate (by means of case studies) the combination of strategies individual airlines use to assemble their overall coping postures. Aviation is acknowledged as one of the fastest growing sources of CO₂ emissions in Europe, and its contribution to total emissions is expected to multiply over the coming years, cancelling out - in large part - the emission reductions achieved in other sectors. However, while most European carbon-intensive industries are already included in current emission reduction regulations, the Kyoto Protocol explicitly excludes emissions from aviation. The resulting political debate on regulatory measures to reduce aviation's impact on climate change is exposing airlines to particularly high uncertainty.¹⁷

Methods and data

We conducted our analysis in four main steps. First (as described in detail below) we applied unique survey data from 133 firms listed in the Dow Jones Global to an exploratory factor analysis in order to categorize their strategies to cope with uncertainty as offensive, defensive and passive. In a second step, we used the resulting categories to compute clusters of firms showing common coping patterns.¹⁸ Clustering is an exploratory data analysis tool to discover structures in observed data

that are not otherwise evident. We applied this analysis to group firms into an a priori unknown number of clusters representing their overall strategic postures toward regulatory uncertainty. Third, we analyzed these clusters to identify differences in firm-specific characteristics that might affect their choice of a strategic posture, using additional information obtained from archival sources such as annual reports or the financial database Compustat. Finally, to exemplify the strategies underlying these strategic postures and to illustrate the interdependencies between them, we also conducted ten case studies in the airline industry, involving a total of 40 interviews – 27 with airline executives and 13 with industry insiders – focusing on airlines’ strategies to cope with uncertainty regarding potential emission reduction regulations. (The Appendix provides details of our data collection, statistical analysis and survey-based measures.)

Coping with regulatory uncertainty

Categorization of strategies to cope with regulatory uncertainty

Three categories of strategies emerged from the factor analysis, each denoting a primary objective in coping with regulatory uncertainty (see Table 1). Two categories encompass strategies that typically require recurrent activities to cope with the uncertainty, addressing it either ‘offensively’ or ‘defensively’. The strategies in the third category can be seen as ‘passive’, enabling firms to tolerate longer periods without have to deal with the uncertainty continuously.

The first category – strategies that seek to go ‘on the offensive’ to cope with uncertainty proactively – include, in particular, strategies such as attempting to influence the causes of the uncertainty or searching systematically for additional information so as to reduce it, allowing firms to counteract uncertainty directly, either individually or in cooperation with others. Firms’ offensive strategies also typically involve undertaking incessant activities to make their coping effective, permanently aligning their flexible strategic options to the various scenarios that might result from the policymaking process.

The second category comprises defensive strategies, which can include carrying out detailed analyses to allow firms to substitute or simplify uncertain decision criteria so as to cope with uncertainty but without countering it directly. Typically, defensive strategies – such as engaging in

Table 1. Factor component analysis^a

No.	Strategy	Category		
		Offensive	Defensive	Passive
1	Investigation	.79		
2	Influencing	.75		
5	Flexibility	.55	.45	
11	Cooperation	.54	.32	
9	Substitution		.77	
3	Stabilization		.65	
12	Imitation		.44	.30
10	Simplification		.41	.38
6	Internal design			.76
13	Withdrawal			.76
4	Integration			.66
7	Postponement		.37	.66
8	No-regret moves	.33		.39

^a Principal components extraction method with varimax rotation. Values less than .30 omitted.

long-term contracts to gain increased stability in uncertain environments – allow firms to avoid being continuously preoccupied with uncertainty. Nevertheless, firms still need to review and adapt their defensive strategies frequently, based on updated information or changed external conditions, for instance by staying abreast of the activities of competitors they seek to imitate.

In contrast, the third category comprises strategies that enable firms to achieve a level of resilience which allows them to endure uncertainty and its effects. While such passive strategies – especially those involving changes in a firm’s organizational structure – are more complex and potentially have more profound ‘one-off’ effect on firms than offensive or defensive strategies, they generally mean firms need to make just one significant adjustment to cope with uncertainty, after which they can resume their business operations relatively independent of it. For example, firms can postpone uncertain decisions in the short-term and seek to minimize the potential negative effects of uncertainty through reorganizing their internal design or integrating their business portfolio in the long term – or indeed, by simply withdraw from those environments characterized by uncertainty, eliminating the need to cope with it once and for all.¹⁹

Strategic postures toward regulatory uncertainty

Four *strategic postures* emerged from our cluster analysis, each combining different sets of strategies. We label these postures as *daredevils*, *coordinators*, *hedgers* and *gamblers* (see Table 2) and illustrate how they are associated with the 13 strategies from our airline industry case studies (see Table 8 in the appendix for strategy pursuit by case airline).

Daredevils

Firms adopting a ‘daredevil’ posture concentrated exclusively on offensive and defensive strategies, predominantly the former, only using the latter more sporadically. Of all the types, these firms coped with uncertainty in the most focused way, relying mostly on trying to counteract regulatory uncertainty directly, without reducing their exposure to it, and without pursuing any ‘fallback’ options. From our case studies, we identified synchronized influencing and investigation strategies as the most common characteristic feature of airlines adopting this posture. For the most part, daredevil

Table 2. Strategy pursuit in clusters^a

No.	Strategy	Cluster			
		Daredevils	Coordinators	Hedgers	Gamblers
1	Investigation	100%	100%	100%	88%
2	Influencing	100%	100%	96%	58%
5	Flexibility	91%	98%	96%	50%
11	Cooperation	94%	100%	100%	46%
9	Substitution	29%	96%	92%	38%
3	Stabilization	41%	80%	96%	13%
12	Imitation	91%	98%	100%	54%
10	Simplification	35%	60%	100%	42%
6	Internal design	9%	28%	96%	21%
13	Withdrawal	0%	6%	36%	0%
4	Integration	26%	30%	80%	8%
7	Postponement	24%	26%	68%	29%
8	No-regret moves	26%	32%	48%	13%

^a Share of firms pursuing strategy

	≥ 85%		≥ 35 – 60%
	≥ 60 – 85%		< 35%

airlines sought to interact with policymakers to advocate their own ideas and to influence the unclear direction of the policymaking process. Interviewees typically made comments such as *'We certainly try to influence the regulatory proposals,'* or *'We actively participate in the policymaking process in order to exert influence on policymakers.'* However, they also used this interaction to collect inside information about the actual direction of this process and other uncertain regulatory details. As one executive explained, *'Our frequent discussions with experts at the EU level help us a lot to better understand all the open issues.'* Besides investigation in the context of their influencing strategy, these airlines typically also collected information from other external sources or used internal analysis to reduce their uncertainty, as well as, in turn, selectively referring the information thus obtained back to policymakers in order to shape policymaking more subtly. Another executive, describing the somewhat conflicting positions of the EU and the US on emission regulation, remarked that *'we cannot facilitate the negotiations, but we can influence them by providing information to policymakers.'*

'Daredevils' sought to interact with policymakers to advocate their own ideas and influence the unclear direction of the policymaking process

Furthermore, airlines adopting this posture occasionally complemented the interplay between investigation and influencing with other offensive strategies. For example, one airline also utilized flexibility, using its superior understanding of the policymaking process to narrow down otherwise unpredictable regulatory scenarios and then design its strategic options according to those it saw as the most likely outcomes. Another (smaller) airline sought additional cooperation via making partnerships, designed to exchange complementary information so as to develop a better joint understanding of the uncertain policymaking process, and thus increase its political influence: as an executive explained, they were looking for allies *'so we can join forces [...] and receive more attention from policymakers.'*

Coordinators

Akin to daredevils, firms adopting a 'coordinator' posture also primarily (and to a similar extent) pursued offensive strategies to cope with regulatory uncertainty, but also applied defensive strategies to a greater extent. Firms in this cluster tried to achieve synergies between their complementary strategies from these two categories by coordinating how they pursued them. For example, while our case studies indicated that, while airlines adopting a coordinator posture made considerable use of both influencing and investigation strategies, they were also more likely than daredevil firms to coordinate them with other offensive strategies, often focusing on cooperating with other airlines in industry associations. As one executive said, *'For many of us [airlines] the IACA (International Air Carrier Association) is the main lever for influencing policymakers. Besides, the IACA also provides us with regular updates on the current status [of the political negotiations regarding a regulation].'* On a similar note, another executive from the same airline explained that this cooperation also facilitated the airline's scenario analysis governing its flexibility strategy, because *'we use the results of a mathematical scenario model that the IACA has developed in order to determine the financial consequences of different [regulatory] conditions [...] to better understand the range of future states.'*

In contrast to daredevils, however, coordinators characteristically rounded out their offensive strategies with defensive elements. For example, they often followed a simplification strategy so as to focus and increase the efficiency of both their investigation and influencing activities, as reflected in such statements as *'We are lacking resources to consider all uncertain issues. Hence, we [...] only examine the key aspects in detail,'* or *'We simply do not deal with issues that are too difficult to influence.'* On a similar note, substituting uncertain regulatory issues by relying on the better understanding they gained through their offensive strategies enabled coordinating airlines to allocate resources in a more target-oriented manner. One executive noted that, despite high uncertainty, *'practically, we assume that a post-Kyoto regulation will be similar to the existing European emission trading system*

[i.e., including the trading of emission certificates]. ... We already designated resources to the trading of emission certificates. We are prepared for such a system.' Finally, coordinator airlines often appeared to balance their offensive strategies with safeguarding moves, such as stabilization and imitation. Thus one airline had signed a contract with a third party that agreed to reduce CO₂ emissions on the airline's behalf (a practice known as offsetting) thereby relieving the airline not only from reducing its own emissions but also (to an extent) from the need to cope with the uncertainty about whether regulation would require it to do so — while an executive from another airline explained that it had imitated this move: *'the main reason for us to think about offsetting was the behavior of our competitors.'*

Hedgers

Firms in the 'hedgers' cluster combined strategies from all three categories, thus adopting the most diversified posture of all. Although hedgers' overall emphasis was on an equal balance of offensive and defensive strategies, they supported these policies with extensive passive strategies designed, effectively, to 'hedge' against the potential negative effects of exposure to the regulatory uncertainty they considered unpreventable by their offensive or defensive strategies. Our case studies exemplify this notion more specifically, showing that hedging airlines typically pursued passive strategies for two main reasons. They aimed to minimize the likely risks of a one-sided focus on offensive strategies: *'Responding to uncertainty sometimes requires bold moves. Of course that includes the risk that you do it wrong.'* But they also sought to guard against the scenario where unexpected political developments might thwart their defensive strategies: thus, although one airline had substituted its uncertainty by aligning its activities with the assumption that future regulation would permit the trading of emission certificates across sectors, one executive admitted that *'the EU's legislation machinery is unforeseeable, which entails a large risk and high uncertainty. [...] There is always the possibility that the political discussion suddenly goes into the opposite direction.'*

Increased resilience enabled 'hedgers' to tolerate uncertainty longer, allowing them to postpone decisions, while also seeking to reduce uncertainty with additional information or analyses.

In particular, hedging airlines used organizational strategies — such as the integration of new business areas into their portfolio or changes in their internal design — to guard against the contingencies that might result from such unexpected developments. Executives repeatedly made such comments as *'We are reassessing our business model'*, or *'We have decided to build up the charter business as a second strategic option.'* These airlines also facilitated their diverse business units, which might be exposed to different regulatory uncertainties, to cope on an individual basis by decentralizing decision making and lowering hierarchies, thus increasing their overall resilience against uncertainty. This increased resilience enabled hedgers to tolerate exposure to uncertainty for longer periods of time, allowing them to postpone decisions affected by the uncertainty, while at the same time seeking to reduce it by collecting additional information or conducting supplementary analysis. For example (in contrast to the case portrayed earlier) one executive reported his airline had deferred a decision on offsetting its CO₂ emissions because of worries about credibility issues, emphasizing that *'early decision making based on uncertain criteria involves considerable risks.'* He noted that the airline's decentralized structure meant that: *'we are good at responding very quickly [because] we are fast in making decisions That provides us with the possibility to wait longer.'*

Our interviews also indicated that, where airlines adopting a hedging posture did not possess the right means to cope with uncertainty actively, they might choose to withdraw from the uncertain environment rather than taking the risk of making unsecured decisions. For instance, an executive of an airline focused on the European market complained about the high uncertainty regarding the regulation of

in-European flights, concluding in consequence that *'we might have to think about [shifting our business from short-haul] towards more intercontinental flights.'* Finally, hedging airlines also often took no-regret decisions i.e., decisions whose outcome would not be affected by uncertainty: *'So far, we have not taken any measures that would not pay off in case the climate change debate was to fade away.'*

Gamblers

Finally, those airlines adopting the posture we label as 'gamblers' did not generally pursue any particular strategy to cope with regulatory uncertainty to any great extent. Effectively, they were 'betting' that the eventual resolution of the uncertainty as to emission regulation would be advantageous to them, and so only applied limited offensive strategies, and hardly used defensive and passive strategies at all. Interestingly, in our case studies we came across two types of airlines adopting this posture, both (but for different reasons) only sporadically applying strategies to cope with post-Kyoto uncertainty. One airline relied on its extensive experience with uncertain regulatory issues to largely abandon most coping strategies. It possessed dependable connections to policymakers and used them for a persistent influencing strategy, as reflected in such comments as *'We have excellent relations with policymakers,'* and *'Foremost, we cope with this uncertainty by [re-]dedicating [existing] lobbying resources to issues associated with an emission regulation.'* To a lesser extent, it also used its experience to adopt a simplification strategy, focusing its investigation strategy specifically on identifying those issues likely to be associated with any post-Kyoto regulation that would have the highest impact on its operations. An executive stressed that: *'experience and connections play a crucial role for gathering the right information.'* With respect to other less critical issues, he added, *'we decided to wait for now.'*

Another airline that chose to pursue virtually no strategies justified its stance (in the words of one executive) by saying: *'the uncertainty does not really influence our behavior as we are acting upon our values and independently of a possible regulation.'* Emphasizing the airline's environmental responsibility, she continued, *'We don't know whether there will be an emission reduction regulation, but we don't really care because we reduce emissions anyhow.'* Other interviewees from this airline repeated these views consistently: *'The uncertainty does not affect our decisions. [...] We will live with whatever we get,'* or *'We would not do anything different if we had certainty.'* While this attitude appeared genuine and was openly promoted by the CEO, the airline also used it to establish legitimacy for its interaction with policymakers and to strengthen its political influence. In particular, the airline seemed to be attempting to benefit from its proactive emission reduction activities by steering the political debate into an advantageous direction. For example, one executive described the two most prominent regulatory designs discussed at the time of our case studies, i.e., the taxation of CO₂ emissions and the issuance of limited but tradable emission certificates, illustrating: *'If you have to choose between light cough and cholera, you choose the light cough. [...] Reducing our emissions was a way to tell the government not to introduce taxes.'*

Factors to consider for adoption of strategic posture

In order to move beyond the anecdotal evidence obtained from the case studies to ascertain the determinants for adopting a specific strategic posture, we reverted to the survey data for further cross-cluster analysis. This analysis showed that the industry and regional composition of each cluster did not deviate significantly from our sample, but that other firm characteristics differed significantly across the postures with respect to cluster means (see Table 3).

Interestingly, firms perceived the uncertainty associated with a post-Kyoto regulation to significantly different extents, with those pursuing a daredevil posture having the lowest level perceptions and those employing a hedging posture having the highest: the perceptions of coordinators and gamblers lay in between. It was noticeable that those firms focusing on offensive and defensive strategies to cope with regulatory uncertainty, (i.e., daredevils and coordinators) produced significantly more CO₂ emissions per year than hedgers and gamblers, which are also higher in proportion to their significantly higher sales. In particular, coordinator firms had the highest CO₂ emissions, almost twice as high as those of the hedgers, while (on average) the gamblers emitted the least CO₂ per year. Results also show that relative CO₂ emissions did not differ significantly across clusters, although both components — i.e., the firms'

total CO₂ emissions and their sales — did. This finding supports other research suggesting that firms partly base their CO₂ emission reduction strategy on total rather than relative CO₂ emission amounts.²⁰

Devising an appropriate strategic posture

This study identifies strategies to cope with regulatory uncertainty. Firms generally apply a wide range of individual strategies, which can be grouped into three broader categories that each focus on different aspects of coping with uncertainty. The study shows how individual firms typically combine strategies from these different categories and adopt one of four overall strategic postures, which appear to relate to certain firm-specific characteristics. We discuss these strategic postures in the following sections, and elaborate on the possible rationales that underlie their adoption, so as to draw conclusions for managers and derive research implications.

Many firms seem to find some way to cope with [regulatory uncertainty]: the majority actively, others passively... some attempt to gamble by not responding to it specifically

Table 3. Cluster composition and mean characteristics

	Cluster			
	Daredevils	Coordinators	Hedgers	Gamblers
Cluster composition ^a				
Firms in cluster	34	50	25	24
Share of firms	25.6%	37.6%	18.8%	18.0%
Industrial Goods	12.9% [†]	38.7%	16.1%	32.3%
Utilities	37.0%	34.5%	24.1%	3.4%*
Basic Materials	36.4%	31.8%	9.1%	22.7%
Chemicals	5.6%*	38.8%	27.8%	27.8%
Transportation	29.4%	47.1%	17.6%	5.9%
Oil & Gas	31.3%	37.4%	18.8%	12.5%
Europe	31.3%	35.9%	17.9%	14.9%
North America	32.3%	48.3%	9.7%	9.7%
Asia	12.0% [†]	24.0%	32.0% [†]	32.0%*
Others ^b	0.0% [†]	23.8%	38.1%	38.1%
Cluster means ^c				
Uncertainty ^d	2.6**	3.1**	3.5**	2.9**
CO ₂ emissions [Mt]	23.0 [†]	23.2 [†]	12.9 [†]	9.0 [†]
Sales [US\$ bn]	26.1*	35.6*	16.5*	16.0*
Relative CO ₂ emissions [kg CO ₂ /US\$ sales]	1.37	1.38	1.01	0.56
Total assets [US\$ bn]	44.9*	58.8*	23.7*	24.9*

^a Significance level for deviation from sample (binomial tests). [†] $p < .10$, * $p < .05$.

^b Australia, South America, and Africa.

^c Significance level for differences across clusters (Kruskal-Wallis tests). [†] $p < .10$, * $p < .05$, ** $p < .01$.

^d Range 1 = very low to 5 = very high.

Many firms exposed to regulatory uncertainty seem to find some way to cope with it, although some attempt to gamble by not responding to it specifically. Among the former, the large majority counter the uncertainty actively, either by coordinating a mix of offensive and defensive strategies or (less frequently) by adopting a daredevil posture and relying almost exclusively on offensive strategies. Only a limited number of firms also deal with uncertainty passively, typically hedging against the potential negative effects of their exposure to uncertainty that they cannot prevent through offensive or defensive strategies.

Two factors appear to be associated with a firm's strategic posture - a firm's perceptions as to the levels of regulatory uncertainty that affect it and the significance for the firm of any likely regulation. The firm's perception as to its level of regulatory uncertainty appears to influence which strategies it adopts to cope with it: specifically, firms coping with higher levels of perceived uncertainty appear to pursue broader ranges of strategies, while those with lower uncertainty regarding a regulation are likely to possess more reliable or more precise information about this regulation, and can therefore address the lack of information and the resulting uncertainty more directly. For example, daredevils exhibit the lowest average levels of uncertainty and adopt the most focused posture towards it, for the most part pursuing only offensive strategies. However, such a posture becomes increasingly difficult as perceived uncertainty rises, so coordinators (who perceive significantly higher uncertainty than do daredevils) pursue defensive strategies to attempt to deal with the residual uncertainty they cannot cope with via offensive means. Finally, at still higher levels of perceived uncertainty, a firm might not be able to cope with it in its entirety by active means, and will, instead, seek to complement its posture with passive strategies that do not require continuous management commitment. Thus hedgers, perceiving the highest levels of uncertainty, adopt a strategic posture consisting of strategies from all three categories.

However, although they perceive a higher level of uncertainty than daredevils, gamblers do not adopt a broader posture: instead, they do not seem to choose to cope with the uncertainty at all, which indicates the influence of a second factor on the choice of a strategic posture. Our results suggest that the extent to which future regulation could potentially interfere with a firm's business activities affects their choice of posture. In particular, the absolute amount of CO₂ emissions a firm produces – and thus the resulting importance to its business activities of future regulation to reduce such emissions – seem to affect how actively the firm attempts to address uncertainty about that regulation. For example, daredevils and coordinators, which emit considerably more CO₂ than others, pursue only offensive and defensive strategies. This could be because there is more at stake for such firms: they are likely to be significantly more affected (in absolute terms) by CO₂ emission regulations than those with low CO₂ emissions, and are thus likely to focus their efforts on countering the uncertainty involved more actively. Gamblers – who have by far the lowest absolute CO₂ emissions - can largely refrain from such attempts.

Based on these findings, we develop a framework to guide managers in their decision as to which strategic posture to adopt, illustrated as [Figure 2](#). This indicates that, initially, managers should identify the key regulatory issues facing their firm and next evaluate their level of uncertainty associated with those issues. In a third step, they should create transparency as to their firm's current coping strategies and, fourth, review the breadth and consistency of those that pertain to their firm's main objectives in coping with the uncertainty. Finally, managers should evaluate alternative strategies that could complement their firm's coping approach, and revise it in line with their uncertainty level. In the course of the regulatory formulation process, managers should also assess frequently whether changes in their exposure to uncertainty, or in the level of that uncertainty, call for them to review their strategic posture again.

Managerial implications

In view of the ever increasing regulations on all kinds of business activities, and firms' practically continuous exposure to the associated levels of uncertainty, managers are obliged to decide what kind of strategic posture is the most appropriate for their firms. Our study yields several insights that can help them with this decision.

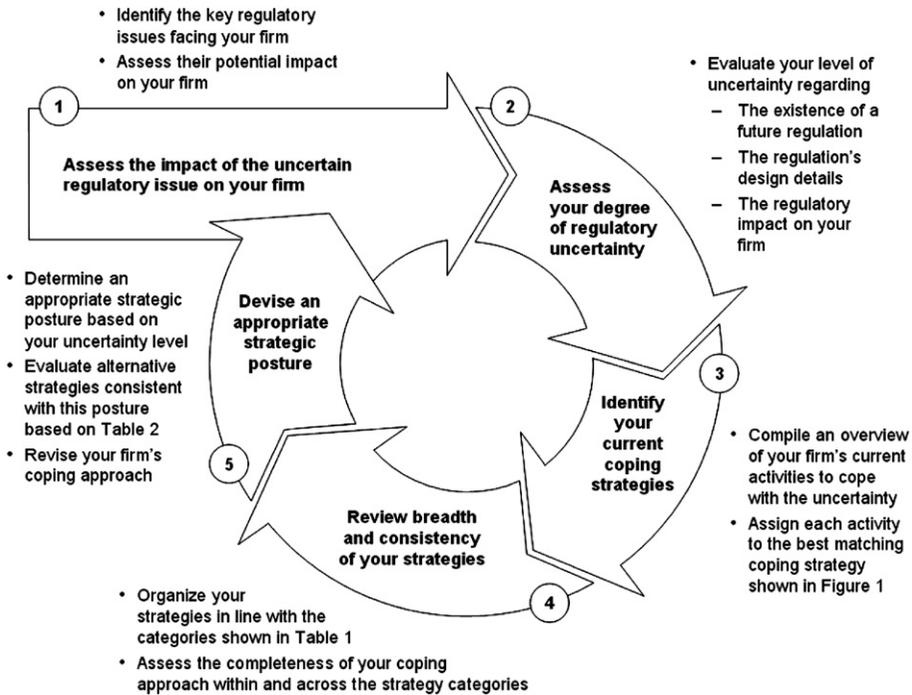


Figure 2. Developing your firm's strategic posture to cope with regulatory uncertainty

First, our study offers a comprehensive strategy overview that provides managers with a good idea of how their firm might cope with regulatory uncertainty. Our results indicate that managers might lack knowledge of the full range of possible strategies: in particular, passive strategies (which account for about one third of all strategies available) are pursued by only a small minority of firms. Moreover, almost half of the firms (daredevils and gamblers) skip defensive strategies as well, hence forgoing two thirds or more of all the strategies open to them (compare Table 3 and Table 8 in the appendix). Awareness of the full range of such strategies can assist managers in making more informed decisions and adopting more balanced strategic postures.

Second, the study provides managers with a general framework on how to combine the strategies while accounting for the interdependencies between them. While, in principle, each strategy can help firms to cope better with regulatory uncertainty, managers can make their firms' overall strategic postures toward this uncertainty more effective by pursuing complementary strategies. The optimal composition of such a posture will depend primarily on firm-specific characteristics, but our findings indicate that certain strategy combinations are more common than others. Although our quantitative analysis does not allow us to draw conclusions regarding the effect of these combinations on the performance of individual firms, managers can use our results to classify themselves and their competitors with respect to their strategic postures, and can also revert to our case study examples to better understand the rationales underlying these combinations and assess their likely applicability to their own firms.

Influencing might be appropriate early on... postponement might be appropriate later when the policy formulation timetable is more definite

Finally, our study outlines several factors that can guide managers in their decision as to which strategic posture to adopt to best cope with regulatory uncertainty. It identifies the significant differences between the underlying strategies in terms of their objectives toward this uncertainty, which managers will need to consider when deciding on their firms' overall strategic posture. Specifically, the study

indicates that managers should choose a combination of strategies based on their assessment of both the potential impact an uncertain regulatory issue could have on their firm, and the level of regulatory uncertainty their firm is exposed to. The impact of regulatory uncertainty is linked to the scale of the underlying issue, which can affect different organizational levels (e.g., the entire firm, individual divisions, business units or single departments) and differ in its geographical scope (e.g., at global, regional or national levels). Adapting the internal design of a firm might be more appropriate if a regulatory issue affects the entire firm on a global scale rather than just one business unit in a particular country, in which case an imitation strategy might be sufficient. Typically, the level of uncertainty changes over time, which points also to the issue of timing a firm's coping strategies. Some strategies - such as influencing - might be appropriate early on, when a regulatory issue starts to develop and policy makers are particularly receptive to corporate inputs in their efforts to structure and fully appreciate the issue at hand. In contrast, a postponement strategy, that puts significant corporate developments on hold, might be more appropriate at later stages when distinct regulatory alternatives have already been forged and a more definite timetable for the policy formulation process has emerged.²¹ Accordingly (as illustrated in Figure 2) managers should be aware that coping with regulatory uncertainty is a dynamic process in which their firm's strategic posture needs to be regularly reviewed. Managers should also note that the obvious variations in both number and type of strategies means that how effectively different postures can be adopted will differ, and points to the intrinsic complexity of managing their simultaneous pursuit: they will always need to match their firms' posture to their firm-specific conditions.

Theoretical contribution and avenues for further research

Our study also holds important implications for the management literature on strategies to cope with uncertainty. First, it provides a more comprehensive and inclusive typology of such strategies that goes beyond previous conceptual frameworks to categorize individual strategies based on firms' actual application. As illustrated in Figure 1, existing frameworks typically cover only a limited set of these strategies, and mostly omit those that our exploratory analysis groups into the defensive category. However, our results demonstrate that the majority of firms make considerable use of strategies from this category, thus revealing a significant gap in the literature that our study contributes to closing.²² More research is warranted to review these findings in other research settings, for example in examining firms' responses to other business environment uncertainties.

Second, the small number of firms applying passive strategies contradicts the long-standing proposition of organization design theorists that firms attempt to cope with uncertainty through structural adaptation, for instance by means of integration or internal design strategies.²³ Our case studies also suggest that firms seem mostly to regard such passive strategies as safeguarding moves that they revert to as a last resort when they can no longer cope sufficiently with uncertainty via offensive or defensive strategies. Subsequent research could therefore build on these initial results to further investigate the timing of different categories of strategies, as well as the development of firms' strategic postures over time.

Finally, while our study is appropriate to examine firms' strategies to cope with regulatory uncertainty, the methodology does not allow us to draw statistically supported conclusions regarding the relationships between strategic postures and firm-specific determinants. However, the results of both our quantitative and our qualitative research provide consistent indications about factors likely to affect the adoption of a particular strategic posture toward regulatory uncertainty. Further research should also seek to expand on these results to achieve a broader understanding of firm behaviour under uncertainty in general, so as to support managers even better in their attempts to identify and adopt effective coping postures: this study is a first step in that direction.

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Appendix

Data collection and sample

For the factor and cluster analysis, data was collected from a survey of the 821 firms in the six most carbon-intensive industries listed in the Dow Jones Global Indexes at the end of March 2007, i.e., the industrial goods, utilities, basic materials, chemicals, transportation and oil and gas industries. These firms were facing particularly high uncertainty during our study, as they were the primary subjects of a post-Kyoto regulation being formulated at that time, targeted at reducing global CO₂ emissions. This population included firms from all the world's main economic regions, reflecting the likely global scope of this regulation. We focused on publicly listed firms due to better data availability from archival sources.

The survey questions were incorporated in a more comprehensive questionnaire on climate change administered between April and June 2007. Considering the limited time of the CEOs and other top executives targeted with the survey, we used single-item measures for each strategy to increase respondent acceptability, following the approach applied in similar studies on firms' strategic responses to critical issues in the business environment.²⁴ Due to the novelty of our research context (post-Kyoto uncertainty), appropriate constructs were not readily available from the literature. To provide for content validity, we based our items on typical measures for the 13 strategies in the literature and adapted them to our research context with the help of industry experts and strategic management scholars focusing on climate change. We then pre-tested our items on executives from selected companies for clear understanding and relevance to carbon-intensive industries.²⁵ An open text field succeeded each item, asking respondents to specify their firm's activities to deal with uncertainty and to provide additional information supporting their ratings. To further substantiate valid construct measurement, we contrasted respondents' ratings with their remarks in these fields and randomly verified them with publicly available information from annual reports, press releases, analyst reports and company websites: these examinations revealed no noteworthy discrepancies, indicating satisfactory construct validity.

As the questionnaire addressed issues related to firms' strategies, target respondents were the firms' top executives, mostly the CEOs or, in case of multidivisional firms, the heads of the businesses operating in carbon-intensive industries. In line with the observation that participants below this level are typically not as well informed on issues pertaining to the organization as a whole, adding additional — less knowledgeable — respondents risked decreasing our survey's reliability.²⁶ 133 firms completed the survey (see Table 4), representing a 16.2% response rate. For our cross-cluster analysis of firm-specific characteristics, we supplemented survey responses with 2006 data on respondents' CO₂ emissions collected from their annual and sustainability reports and with financial data obtained from the database

Table 4. Sample Composition

Industry	Location				Total
	Europe	N. America	Asia	Others ^a	
Industrial Goods	11	8	11	1	31
Utilities	15	9	4	1	29
Basic Materials	13	4	3	2	22
Chemicals	10	5	2	1	18
Transportation	11	1	4	1	17
Oil & Gas	7	4	1	4	16
Total	67	31	25	10	133

^a Australia, South America and Africa.

Table 5. Overview of interviewees

Function	Airline										Total
	A	B	C	D	E	F	G	H	I	J	
Executive board/Strategy ^a	-	1	1	1	1	2	1	1	1	2	11
Regulatory/External affairs	1	1	1	1	-	1	2	1	-	1	9
Environment/Technical division	1	1	-	-	1	1	1	-	1	1	7
Total	2	3	2	2	2	4	4	2	2	4	27

^a At least Director/Vice President level.

Compustat. We collected this data for the financial period preceding the survey, except for return on assets, which was measured for the year of the survey.

We also conducted 40 (mostly one to two hour) interviews in the European airline industry between July and October 2007, comprising interviews with 27 executives from ten airlines (see Table 5) and nine experts – four national and international airline association representatives and five independent industry consultants. Aside from follow-up calls (typically conducted with airline executives) we talked to each interviewee once, except for three experts, two of whom were interviewed twice and one three times. Seeking to study a heterogeneous sample we selected various national mainline carriers for these interviews, as well as leading and niche players from the low-cost, regional and leisure segments that differed in terms of their flight plans and fleet characteristics (see Table 6). (Two of the ten airlines had already participated in the survey.) In order to gain access to airlines’ top executives and to facilitate open discussions of strategically relevant issues we had to agree to confidentiality, and have therefore anonymized the interview statements reproduced in this article and refer to cases A to J to prevent the profiling of individual airlines.

Table 6. Airline profiles

Airline	Business model	Route network ^a			Destinations ^b		Fleet size ^b		Strategic posture
		Short-haul	Medium-haul	Long-haul	Total	Thereof Europe	Total	Thereof owned	
A	Mainline	•		•	>150	35%	>150	20%	Daredevil
B	Mainline	•	•	•	51–100	60%	51–100	95%	
C	Leisure	•	•		51–100	80%	51–100	80%	Coordinator
D	Regional	•	•		101–150	75%	26–50	90%	
E	Leisure		•	•	<25	35%	<10	100%	
F	Low-cost	•	•		<25	100%	10–25	100%	Hedger
G	Leisure		•	•	51–100	50%	26–50	100%	
H	Low-cost	•	•		51–100	70%	51–100	85%	
I	Mainline	•	•	•	>150	55%	>150	95%	Gambler
J	Regional	•	•		101–150	90%	101–150	20%	

^a At least 10% of destinations reachable from hub. Short-haul flights are shorter than three, medium-haul flights between three and six, long-haul flights longer than six hours.

^b Figures rounded for confidentiality.

Table 7. Final cluster centers

	Cluster			
	Daredevils	Coordinators	Hedgers	Gamblers
Offensive ^a	1.00	.98	.85	.43
Defensive ^a	.22	.68	.85	.19
Passive ^a	.03	.00	.53	.09

^a Scales representing strategy type pursuit, normalized to range 0 = very low to 1 = very high.

Data analysis

To derive the relationships underlying firms’ responses designed to cope with regulatory uncertainty, corresponding respondent scores were submitted to exploratory factor analysis. Three factors emerged from this analysis with eigenvalues greater than 1 which explained 49.9 percent of the total variance and which represent three distinctive approaches toward regulatory uncertainty – offensive, defensive, and passive (as noted in Table 1 in main text). Computation of Cronbach’s alphas for these approaches yielded values of .73, .68 and .72 respectively, indicating acceptable reliability.²⁷ Using a regression method, factor scores for the three approaches were computed for each respondent, and a hierarchical cluster analysis using Ward’s method produced four as the optimal number of clusters. Based on respondents’ factor scores, K-means cluster analysis was conducted to group firms with similar coping strategies into our four distinctive clusters - daredevils, coordinators, hedgers and gamblers (see Table 7).²⁸ We used binomial tests to compare cluster and sample composition with regards to industry and regional affiliation and Kruskal-Wallis tests to analyze means of perceived uncertainty, total CO₂ emissions, and financial indicators across the clusters. In the cases where this analysis rejected the null hypothesis (that assumed cross-cluster equality) we conducted Mann–Whitney tests to compare individual clusters with the sample mean and with each other. For the content analysis of the qualitative data, we transferred interviewees’ statements from the interview protocols onto a separate

Table 8. Strategies pursued by airlines^a

No.	Strategy	Airline									
		A	B	C	D	E	F	G	H	I	J
1	Investigation	•	•	•	•	•	•	•	•	•	
2	Influencing	•	•	•	•	•		•	•	•	•
5	Flexibility	•	•	•	•	•	•		•		
11	Cooperation		•	•		•	•	•			
9	Substitution			•	•	•	•		•		•
3	Stabilization				•			•	•		
12	Imitation		•	•	•	•	•	•	•		
10	Simplification			•		•	•	•	•	•	
6	Internal design					•	•				
13	Withdrawal						•				
4	Integration							•	•		
7	Postponement	•	•					•	•	•	•
8	No-regret moves			•				•	•	•	
Strategic posture		Daredevil		Coordinator			Hedger			Gambler	

^a Response strategy identified in interview protocol at least once by each rater.

case study database.²⁹ One of the authors and an independent researcher (who had not been present during the interviews) then screened the database for statements indicating interviewees' perception of post-Kyoto uncertainty and for statements describing either their pursuit of, or a deliberate choice against, particular response strategies. In a second step, both researchers coded each statement separately: inter-rater reliability analysis yielded a Kappa coefficient of 0.83, demonstrating satisfactory consistency between raters.³⁰ Finally, they classified the airlines based on a summary of their individual coping strategies (see Table 8), again with no inconsistencies. The survey-based classification of the two airlines that had completed the questionnaire corresponded to their respective strategic posture as derived from the content analysis of the interview protocols, further corroborating the rigorosity of our approach.

Survey-based measures

[All items had five-point response formats. Comments in italics for explanation only, not included in questionnaire.]

Perceived regulatory uncertainty ($\alpha = .80$)

Please indicate how certain your company is about the following features of a possible regulation to reduce the CO₂ emissions of your company after 2012.

1. The existence of a CO₂ emission reduction regulation for your company after 2012.
2. The design details of a CO₂ emission reduction regulation for your company after 2012.
3. The impact a CO₂ emission reduction regulation on your company after 2012.

Responses to regulatory uncertainty

Please indicate which activities your company currently pursues to deal with the uncertainty related to a possible regulation to reduce the CO₂ emissions of your company after 2012 and rate the respective extent of the pursued activities.

1. We systematically search for additional information. *[Investigation]*
2. We engage in the policy-making process to contribute to the decision making. *[Influencing]*
3. We postpone our strategic decisions until we have more certainty. *[Postponement]*
4. We rearrange our portfolio through mergers, acquisitions, or divestures to be less exposed to regulatory uncertainty. *[Integration]*
5. We select specific issues in our business environment to focus on in order to simplify decision making. *[Simplification]*
6. We change our organizational structure, e.g., by increasing decentralization or lowering the degree of formalization, to better deal with the uncertainty. *[Internal design]*
7. We prepare for more than one potential outcome of the policy-making process. *[Flexibility]*
8. We join forces with others, e.g., suppliers, customers, or competitors. *[Cooperation]*
9. We observe the activities of other companies and follow them if appropriate. *[Imitation]*
10. We create predictability, e.g., by negotiating contracts or long-term rules with other companies or the government. *[Stabilization]*
11. We agree on the regulation scenario we consider the most likely and focus on preparing for this scenario. *[Substitution]*
12. We shift our business to markets probably not affected by a regulation. *[Withdrawal]*
13. We only make investments which have a guaranteed positive return regardless of the outcome of a possible future regulation. *[No-regret moves]*

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reenactment of a response strategy once the initial stabilizing effect decreases, for example once a long-term contract expires. On the other hand, withdrawing from an uncertain environment represents the ultimate avoidance of uncertainty, allowing a firm to entirely refrain from coping with this uncertainty for good. Finally, avoidance through postponement can be brief, for example until an expert has been consulted by means of a phone call to inform a decision, or very long, for example until the uncertainty has completely resolved. Our data reflect these considerations and further show that respondents tended to apply postponement as an avoidance strategy for the long term, which seems reasonable given the complex nature of post-Kyoto uncertainty and the difficulties in gathering additional information about its resolution.

20. G. Weinhofer and V. H. Hoffmann, Mitigating climate change - how do corporate strategies differ?, *Business Strategy and the Environment* **19**(2), 77–89 (2010).
21. C. Engau and V. H. Hoffmann, Effects of regulatory uncertainty on corporate strategy - an analysis of firms' responses to uncertainty about post-Kyoto policy, *Environmental Science & Policy* **12**(7), 766–777 (2009); C. Engau and V. H. Hoffmann, Corporate Response Strategies to Regulatory Uncertainty: Evidence from Uncertainty about Post-Kyoto Regulation, *Policy Sciences* **43**(4), (2010); doi:10.1007/s11077-010-9116-0.
22. Applying this limited set of strategies to a factor analysis results in two factors with eigenvalues greater than 1. The results for offensive and passive strategies do not differ from a factor analysis with the full strategy set, with all offensive strategies (1, 2, 5) loading on factor 1 and all passive strategies (4, 6, 7, 8) loading on factor 2. The stabilization strategy (3), which loads on the factor labeled defensive in the original analysis, loads on factor 1 in the adjusted analysis. In consequence, including all thirteen strategies in the factor analysis provides a more detailed understanding of strategies to cope with regulatory uncertainty, yielding an additional category by differentiating offensive and defensive strategy types.
23. See, for example, J.R. Galbraith, (1973) op. cit. at Ref. 8; P. R. Lawrence and J. W. Lorsch, *Organization and Environment: Managing Differentiation and Integration*, Harvard Business School, Reading, MA (1967); J. D. Thompson, *Organizations in Action*, McGraw-Hill, New York (1967).
24. N. Schmitt and D. M. Stults, Factors defined by negatively keyed items: the result of careless respondents?, *Applied Psychological Measurement* **9**(4), 367–373 (1985); and C. A. Schriesheim and R. J. Eisenbach, An exploratory and confirmatory factor-analytic investigation of item wording effects on the obtained factor structures of survey questionnaire measures, *Journal of Management* **21**(6), 1177–1193 (1995) show that scale length can affect responses, suggesting that keeping measures short is an effective means of minimizing response bias. Accordingly, N. M. Carter (1990) op. cit. at Ref. 6 uses single items to measure firms' pursuit of 12 strategic activities in response to environmental uncertainty, and C. Smart and I. Vertinsky, Strategy and the environment: A study of corporate responses to crises, *Strategic Management Journal* **5** (3), 199–213 (1984) use single items to measure 14 corporate responses to crises. Similarly B. Clemens, C. E. Bamford and T. J. Douglas, Choosing strategic responses to address emerging environmental regulations: size, perceived influence and uncertainty, *Business Strategy and the Environment* **17**(8), 493–511 (2008); use single-item measures to operationalize 16 response strategies to regulatory changes based on a typology developed by C. Oliver, Strategic responses to institutional processes, *Academy of Management Review* **16**(1), 145–179 (1991).
25. D. C. Hambrick, Environment, strategy, and power within top management teams, *Administrative Science Quarterly* **26**(2), 253–275 (1981).
26. F. J. Aguilar, *Scanning the business environment*, Macmillan, New York (1967); R. L. Daft and K. E. Weick, Toward a model of organizations as interpretation systems, *Academy of Management Review* **9**(2), 284–295 (1984) suggest that only a small group at the top executive level is knowledgeable about the effects of strategic issues such as uncertainty about global environmental regulation that affect an organization as a whole. In consequence, survey instruments measuring related organization level action typically focus on the firm's CEO or Vice Presidents. For recent examples, see B. Clemens, C. E. Bamford and T. J. Douglas, Choosing strategic responses to address emerging environmental regulations: size, perceived influence and uncertainty, *Business Strategy and the Environment* **17**(8), 493–511 (2008); P. Christmann, Multinational companies and the natural environment: determinants of global environmental policy standardization, *Academy of Management Journal* **47**(5), 747–760 (2004).
27. J. C. Nunnally, *Psychometric theory*, McGraw-Hill, New York (1978).
28. J. F. Hair, R. E. Anderson, R. L. Tatham and W. C. Black, *Multivariate data analysis*, Prentice-Hall, Englewood Cliffs, NJ (1998).
29. R. K. Yin, *Case study Research: Design and Methods*, Sage, London (2003).
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Biographies

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