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ARTICLE

Strategic ignorance and politics of time: how expert knowledge framed shale gas policies

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ABSTRACT
This article addresses the various uses of expert knowledge during the controversy over shale gas in France and in Quebec (Canada). Cross-fertilization between policy analysis and science and technology studies demonstrates that political uses of expertise better explained the policymaking process in focusing on two specific utilizations: strategic ignorance and politics of time. Using data from press analysis, interviews, reports and documentation analysis, this article shows that social movements can also use strategic ignorance to support their environmental claims and that mastering the pace of the controversy and the policy debates enabled actors to better support their policy claims. The French case illustrates those two arguments while the Quebec case provides a more tradition account of State/Industry's utilization of knowledge production to delay decision and divert opposition.

KEYWORDS
Hydraulic fracturing; shale gas; expert knowledge; public policy; strategic ignorance; politics of time

1. Introduction

Shale gas exploration emerged in the late 2000s in France and in Quebec (Canada),[1] creating new economic opportunities as well as environmental mobilization because hydraulic fracturing took place outside of any specific policy frame. In fact, while the technique itself was not new, it was confined to a specialists' area, and it did not have much regulation designed to address its development. Therefore, hydraulic fracturing was new in the public and policy arena, generating definitional struggles between framing it as an innovation bringing economic benefits or an environmental threat. Comparisons between states within the United States (Weible and Heikkila 2016), between the United States and Europe (Metze and Dodge 2016; Weible et al. 2016) and within the European Union (Goldthau and Labelle 2016; Van de Graaf, Haesebrouck, and Debaere 2017; Patterson and McLean 2018) have stressed different policies regarding shale gas. The role of frames have been explored in various countries to show the impact of prime-movers toward shale gas (Rabe and Borrick 2013), the conditions of success of a discourse (Sica and Huber 2017; Bomberg 2017), the various storylines about shale gas (Cotton, Rattle, and Van Alstine 2014), or the support of specific communities to narratives (Howlett and Hartwig 2017). Frame analysis had also been used to understand shifting policies (Lis and

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Stankiewics 2017; Dodge and Lee 2017; Metze and Dodge 2016) or changing dominant coalitions (Weible et al. 2016; Heikkila et al. 2014). What remains relatively unexplored in the literature, however, is the role of expert knowledge in structuring policy narratives. Lachapelle, Montpetit, and Gauvin (2014) underlined the public perception of expert credibility depending on how experts framed issues. Molinatti and Simonneau (2015) questioned experts' engagement in the controversy, while Widener (2018) focused on the role of citizen experts in shaping shale gas narratives.

Analyzing the controversy over shale gas, the article demonstrates that expert knowledge is not only an instrumental input for policymakers (Collins and Evans 2017), but it also fulfills symbolic functions (Boswell 2009). It explores particularly two symbolic functions that are strategic ignorance (McGoey 2012) and the politics of time (Kirsch 2014). The case analysis demonstrates that French opponents prevented exploratory assessment over shale gas resources and defeated the delay tactic suggested by some policymakers, while Quebec shows a production of knowledge encompassed within traditional governance of the pace of the controversy.

A comparison of France and Quebec is particularly relevant for studying the usage of expert knowledge. First, the controversy started in both locations in 2010, at a time when much uncertainty was attached to the shale gas industry, allowing policy actors to broadcast conflicting expertise. Second, the temporality and the policy solutions differed despite similar social movements, leading to the question of what factors tipped the policy decision and what role expert knowledge played. Third, the expertise used in the two cases differed as did the conditions for the successful use of that expertise.

The article starts with the theoretical objectives of the analysis and then explains the methodology. It then presents the dynamics of legitimation of expertise in both cases. Finally, it defends two main arguments regarding the use of strategic ignorance and the politics of time.

2. Policy-making and the political uses of expert knowledge

Scholars understand policy problems as a social construction, which depend on the meanings that policy actors attach to them. Discursive approaches to policy-making define the policy process as the competition between policy frames/discourses/narratives, which are statements or bundles of statements simplifying and orienting a given problem's understanding. Frames require active work of constructing meaning and offer a wide schema of interpretation, enabling individuals to perceive and to label the world at large (Goffman 1974, 21). Frames are also a medium of persuasion. The framing process is thus not only a neutral simplification of an issue (Lachapelle, Montpetit, and Gauvin 2014), but rather a central tool to shape representations of an issue and of its policy solution. However, these approaches sometimes endow discourses with proper impact on policy change by lessening the role of supporting actors (Fischer and Forester 1993), while theories such as the Advocacy Coalition Framework focus on the role of actors without much attention to the argumentative struggle between them (except with respect to their 'beliefs') (Sabatier and Jenkins-Smith 1993).

The notion of a policy statement (Zittoun 2014) offers interesting insight because it reunites the actor with the discourse. The definition of a policy statement involves making, propagating, and politicizing statements linking an issue to a solution, and determining legitimate actors, targeted audiences and urgency to act. Actors' statements are not only discursive, but actors also perform them in different spaces. A statement should be strong enough to go through different arenas without losing its meaning, but also flexible enough to adapt to various audiences. However, the specific role that expert knowledge plays in the construction of these statements remains understudied.

Policy analysis literature mostly analyzes the role of knowledge as an input for policy learning (Dunlop and Radaelli 2018), or a relative abstract process leading to policy change (Moyson 2017). Thinking about expert knowledge as an input favors the idea defended by Collins and Evans (2017) that a boundary between science and society is necessary to assert the positive role of scientific knowledge. On the contrary, this article purports that policymakers do not resort to expert knowledge to improve the quality of policy choices. Rather they exert power by way of knowledge (Weber [1922] 1978). Expert knowledge encompasses hidden ideologies and coalitions play a role in shaping knowledge production and mobilization (Fischer 2009). STS depicts expertise as an actor's symbolic resource that allows them to contest regulation (Jasanoff 1990), to promote policy solutions (Haas 1992), to legitimize an organization or a policy preference, to demonstrate rational decision-making (Boswell 2009), or to delay decision (Oreskes and Conway 2010; Frickel et al. 2009).

The contribution of the article is to examine the particular role of two symbolic utilizations of expert knowledge in policy-making. First, drawing on McGoey (2012) and Wagner (2015), the article suggests that strategic ignorance – that is, intentionally using the area of non-knowledge, plays similar role that knowledge production in policy-making. Most of the literature on strategic ignorance has stressed the role of industrial and state actors to conceal knowledge, to avoid the development of certain area of knowledge or to produce uncertainty harmful to policy decision (Oreskes and Conway 2010; Proctor 2008). Another stream of research has underlined the role of citizen knowledge to fill the gap of undone sciences (Hess 2016; Frickel et al. 2009). This is particularly true with shale gas development that generated, for example, the production of alternative assessments about monitoring watersheds (Kinchy 2016; Kinchy, Parks, and Jalbert 2016). This citizen science leading in some cases to what Widener (2018) called a civic boomerang effect that is the expansion of initial critics to the whole industry of hydrocarbons. The article demonstrates similar uses of strategic ignorance both as a process to delay decision and as a resource to impose policy solutions, but more interestingly, it shows that strategic ignorance can also be used by opponents to curtail industrial development.

Second, the article develops the notion of politics of time that is the strategic use of time (both as delay and as schedule) to fulfill political goals and to constrain the agency of other actors. Kirsch (2014) developed this notion to explain how environmental assessments of the mining industry in New Guinea went along the exploration phase, enabling the company to prove the interest of mining while the environmental impacts, along with opponents claims, were downplayed (Bebbington and Bury (2013) showed similar dynamics for mining activities in Latin America). In France, Barthe (2006) and Blanck (2017) insisted

on the role of time in governing the burial of nuclear waste: policymakers diverted opponents with scientific assessment of alternative solutions while they continuously supported their initial plan of geological storage. Therefore, the politics of time describe the power deriving from mastering the clocks. We use this notion to stress the efficiency of contesting extractive industries right from the exploration phase. However, there is a second aspect of those politics of time that Metze (2018) called futurity framing, related to the way actors defined the urgency to act and the timeframe of action. Echoing Chateauraynaud and Debaz (2017) and Partridge et al. (2018), shale gas makes a case for the observation of the struggle between a short-term urgency of economic actors about the energy security and a long-term urgency of environmental actors about the contribution of fossil fuel to climate change. Following Muller (2018), the article outlines how climate change offers an opportunity to impose new futurity frames. The article demonstrates how those two sides of politics of time played both in delaying or accelerating the pace of the controversy, and in shaping the dominant frame defining shale gas for policymakers.

3. Methodology

The author identified main actors and their policy statements through press analysis (1,400 press articles in five major national newspapers between 2008 and 2013), participation in shale gas events (conferences, public protests, and meetings) and dedicated publications. Forty five semi-structured interviews have been conducted between 2012 and 2014 (see Table 1). Policy frames were identified from three main sources: press analysis gave us main media frames at different period of time through the presence of specific arguments within the articles, attached or not to policy actors; official reports and regulation gave us main policy frames depending of the administration drafting the texts; interviews validated those frames for some main actors.[2] The author used snowball sampling to operationalize the coalitions. Interviews and press analysis provided data to reconstruct the policy statements of coalitions, the value attributed to expert knowledge, and an understanding of the means stakeholders used to persuade policymakers. Data provides subjective definition of policy change (Zittoun 2009) with internal (administrators and members of parliament, MPs) and external (industry and industry associations) assessments of policy change and integration of various actors' concerns during the policy process.

Table 1. Categories of interviewees.

	Quebec	France
Anti-shale gas	7	8
Pro shale gas	1	3
Local officials	5	5
Members of parliament	0	1
Scientists	3	7
Civil servants	2	3
Total	18	27

The article assesses the legitimization of expert knowledge in the public debate using a combination of methods. Seven official reports drafted to produce information about the public problem provided the main material and the author then compared them to the policy decisions during the same period (2006–2017). Analyzing the reports as advice to policymakers, the author outlined conflicting policy statements and expert knowledge that the commissions settled. A qualitative analysis of the reports examined how the authors defined the issue, its characters and its solution. A quantitative analysis focused on 1,100 interviews made by the seven committees and 1,385 bibliographical report sources providing the cognitive frames about the issue and its solution. The author gathered the interviewees and the (authors of) citations, organizing them based on their affiliation (state institutions, single citizen, companies, etc.) to underline what groups of actors were the most dominant during the hearings and through their bibliographical inputs. The scientific references category encompasses peer-reviewed articles, scientific publications, reports, or books based on the scientific status of its authors. The author deduced the scientific discipline from either the first author's Ph.D. discipline, or from the reviews' discipline. The author categorized documents labeled by oil and gas companies or Environmental Non-Governmental Organizations (ENGO) as separate sources of expertise. Additionally, the author classified individual citizens as associative expertise because they mostly defend one point of view (Fortin and Fournis 2013).

The article used different variables to explain the legitimization of expert knowledge. It suggests that the type of commissions assessing the public problem determined the legitimacy of expert knowledge in the policy forum. Previous governance of environmental controversies, existing regulation, and the electoral calendar shaped committees' choices and practices. The legitimacy of expert knowledge facilitates a change in policies only if it matches the government's policy preferences. Differentiating the policy process and policy solutions, the article explains how coalitions harnessed both alternative expert knowledge and strategic ignorance to delay or accelerate decision in favor of their policy preferences.

4. Legitimizing confrontational knowledge: strategies of actors and policy outcomes

4.1. *The politics of shale gas: coalitions, statements, and policy changes*

4.1.1. *France: marginal supporters facing flash mobilization*

In France, a dormant pro shale gas coalition composed of civil-servants and companies initially controlled the issuance of licenses regulated by the subsurface mineral rights. An administrative department (*Bureau Exploration-Production Hydrocarbures – BEPH*), part of the Ministry of the Industry, granted 12 exploration licenses for shale oil in 2008 and three licenses for shale gas in 2010, and the bureau was still evaluating 64 demands (CGIET/CGEDD 2012). Shale gas licenses were granted following a business-as-usual procedure without high expectation but also without particular concern for environmental assessment. Press analysis confirms both positive perception of hydraulic fracturing as an innovation and low attention on the topic prior to social mobilization. However, subsurface exploration was clearly marginalized within the administration because it was a declining industry since the 1990s without political interest (Chailleux, Merlin, and

Gunzburger 2018). A handful of exploration companies defended a new business opportunity and the mastery of the techniques, but they did not organize prior to contestation. During the first weeks of mobilization, supporters did not respond to the critiques. They only coalesced after the ban to promote alternative techniques and exploration.

In 2011, the anti-shale gas coalition suddenly emerged in a flash mobilization (Terral 2012). Journalists, activists and local officials 'discovered' the licenses in late 2010 and reactivated networks they had previously mobilized against Genetically Modified Organisms (GMO) and nuclear energy (Chateauraynaud and Debaz 2011). José Bové, the movement's herald in early 2011, made himself famous during his fight against GMO in the 2000s. The heterogeneous coalition gathered activists, local officials, MPs,[3] inhabitants, farmers, parks managers, etc. They denounced opaque administrative procedures and contradicted arguments about energy transition but, most importantly, they fought for the cancelation of the contested licenses, and later for the prohibition of the entire unconventional oil and gas industry. They imposed a negative meaning on hydraulic fracturing in stressing its risks and uncertainty, saturating the media with this new definition: within a few weeks, the argument that hydraulic fracturing is a threat dominated and was taken over by journalists. Opponents broadcasted this claim based on the large diffusion of Gasland, an American documentary showing the devastating effects of the shale gas industry, printing the image of tap water catching fire in the public arena.

The government soon abandoned the defense of shale gas with the existing regulation. Most political parties sided with opponents because they were locally required to support the public's outcry as it was less than a year before the general election and because the industry did not represent many economic advantages in their ward which were focused on tourism and agriculture. The committees commissioned between February and March 2011 did not stop the social movement which perceived them as a tactic move to demobilize, already used for GMO or nuclear contestation (Barthe 2006). Using shale gas a political marker, socialists MPs introduced bills to forbid shale gas exploration, soon imitated by majority leaders hailed in their own ward nearby Paris in the wake of a political defeat at local elections. The definition of a political urgency accelerated the controversy. The Jacob bill was transformed into a ban on hydraulic fracturing in early summer even though the bill also forecasted experimentation on the technique and annual reassessment of the ban. This succeeded in scaling-down mobilization but it also confined the issue of governance and energy transition to future reforms.

4.1.2. *Quebec: strong proponents facing a slow but steady opposition*

In Quebec, the pro-shale gas coalition was stronger than in France because it gathered numerous companies – organizing them into a newly formed association (2008) – and included the Liberal government. The industry's scope was also wider than in France because the Ministry of Natural Resources granted more than a hundred licenses between 2006 and 2010 to more than 20 companies. The coalition controlled the procedures, defined by subsurface mineral rights, mobilizing only the administration – the Ministry of Natural Resources – and the companies. Proponents valued the economic opportunity (MNRF 2010). Their policy statement lost its grip, however, when prices dropped.

The anti-shale gas coalition slowly organized by gathering together local committees, local officials, ENGOs, and scientists (2009–2011). Initially, they only criticized the

industry's governance, which made no provisions for impact studies (Fortin and Fournis 2013). Later, when impact studies were underway, they opposed the use of hydraulic fracturing and stressed a contradiction with the energy transition away from fossil-fuels to renewables. Contrary to France, opposition leaders were not from political parties. Despite the presence of street protests, opponents mobilized in a different way; they mostly argued against the government during public hearings (2010 and 2014) and environmental assessments (2011–2014) (Fortin and Fournis 2015). Opposition in Quebec mostly complied with official procedures while French opponents chose direct confrontation. A moratorium, targeting the shale gas industry, was implemented between Montreal and Quebec in 2011 and validated in 2014, but it did not ban hydraulic fracturing because other oil and gas projects were under development elsewhere in the province. Nevertheless, the anti-coalition succeeded in shifting the policy frame from 'shale gas is an economic opportunity than can be managed by the existing regulation'[4] to 'the development of a hydrocarbon industry necessitates policy reforms.' Reforms occurred on the mineral rights (2013), water intake regulation (2014), and through a specific bill on hydrocarbons (2016), but they only framed the development of oil and gas projects.

4.2. *A legitimate expert knowledge: more eco-based in Quebec, more engineering-focused in France*

4.2.1. *The initial containment of expertise and its impacts on policy statements*

The initial legitimate expertise was limited to geology, engineering, and the economy which enabled two situations to rise: in Quebec, the geological assessment allowed for economic estimation, and in France, geological uncertainty precluded any estimation of recoverable resources.

In Quebec, the dominant coalition used economic expert knowledge and defined shale gas as an opportunity. The Minister of Natural Resources valued natural resources exploitation based on the free mining principle (meaning that subsurface mineral rights subvert other land use regulation). The Liberal government described the industry as 'an opportunity not to be missed' (Minister of Natural Resources in Shield, 'Gaz de schiste: Normandeau fait vibrer des cordes sensibles', le *Devoir*, September, 15th 2010). Companies compiled existing subsurface databases to assess the potential resources estimated from those in the United States (interview with Quebec Oil Gas Association (QOGA) 2013). It was crucial to both reassure investors by proving the presence of gas and demonstrating the capacity to extract it. Exploratory drilling confirmed the potential for gas in 2008 when the price of gas was at its highest at US$13/MBTU (Million British Thermal Units). Consulting firms (Secor 2010; MacKie Capital 2010) and the Ministry of Natural Resources (2010) produced an estimation that stressed job creation and tax revenue generation. Proponents, therefore, developed credible statements about the positive impact, confirming the economic and political interests in support of shale gas development.

In France, the administrative procedure focused on the technical ability to access the resource and valued geological mapping. Civil-servants described exploration as a means to map the subsurface at the expense of the oil and gas companies (interview with BEPH 2014). Most proponents stressed the importance of exploration for mapping the potential and uncertain resources (interview with*Union Française del'*Industrie

Pétrolière (UFIP) 2012). The French government, however, precluded companies from drilling before they were able to produce convincing estimates. Thus, uncertainty over the potential resources remained. The absence of data over the recoverable resources limited promoters' ability to develop arguments about jobs, royalties and energy independence. In France, geological uncertainty prevailed and limited economic argumentation.

4.2.2. *The expansion of legitimate expertise*

Opponents made three uses of expertise to construct alternative policy statements: they contested the assessment of the policy's previous owners, they expanded the boundaries of the controversy, and they rooted their statements in the local communities.

First, opponents mobilized alternative expert knowledge to contest the previous definition of shale gas as an opportunity. The closeness of the 'family of engineers' was suspect for opponents:

> 'We understood that the information to which the government had access was totally inadequate. I asked the Ministries: where did this information come from? And they told me: we got it from the company' (interviw with Quebec Alternative Scientific Committee on Shale Gas 2012).

Opponents enlisted retired engineers and geologists. They opposed the expertise from companies on their alleged mastery of the techniques and their relative safe utilization based on the 'best practices' of the industry. For example, a geologist from the *Université Du Québec* À *Montréal* who was critical of the industry became a public figure for the opposition in Quebec but was at a clear disadvantage given his lack of practical experience in drilling for oil. Taking part in several interviews, conferences, and public hearings from 2011 onward, he gained credibility in the media and amongst opponents. He contradicted the recoverable ratios used to assess the resources, he denounced the quality of cementation, or he asked for a long-term assessment of methane leaks once the wells were abandoned. In 2013, he voiced his arguments in a compelling manner during hearings about energy orientations, but in 2014 the newly elected Liberal government discarded the report. Nevertheless, alternative expert knowledge contested and weakened dominant statements about the efficient legal framework and technical mastery.

Second, opponents called upon alternative expertise to expand the scope of the inquiry and the definition of the problem. In December 2010, opponents in Quebec created a scientific committee with more than 170 professors and researchers, which brought together all kinds of specialists. These experts included new disciplines to be acknowledged, such as law, economics, or public health. Jurists helped generate tools to check the industry development, such as the *règlement Saint Bonaventure*, a municipal bylaw preventing gas companies from injecting chemicals into the ground near water intake. The spread of this bylaw spurred the government to reform water intake regulation in 2014. Academic economists (Batelier 2010) debunked the data that consulting firms produced (Secor 2010; MacKie Capital 2010). The 2014 Strategic Environmental Assessment (SEA) included these criticisms. These experts used media coverage, public meetings, or legal loopholes to legitimize alternative expertise. The expansion of the controversy's boundaries gave opponents new grips for targeting the

governance and questioning the initial knowledge the government used to decide to support the industry.

Third, opponents called upon local knowledge to highlight the specific impact the industry could have locally. In France, experience-based experts intervened through the role of speleologists warning about the specific nature of the southern French subsurface where its cavities and faults could allow chemicals spills to reach ground water and could weaken the wells' cement. The local knowledge of those speleologists echoed in their communities, making their claims more relevant for the locals. A local hydrogeologist supported their claims. He participated in opponent coalition-organized conferences on shale gas in order to raise the profile of under-analyzed issues related to water. He influenced some conclusions of later reports (CGIET-CGEDD 2012) over the karstic nature South-Eastern France's topography. The conflicting assessment of relevant expertise stressed the normative framing encompassed in administrative procedures.

4.2.3. *The technical stubbornness of the industrial response*

The industry's response to critics appeared ineffective because promoters rarely saw the opportunity to embrace a global answer to what they perceived as a lack of social acceptability and a deficit of technical understanding.

In Quebec, promoters defended the legitimacy of their expert knowledge, but they ultimately lost credibility. When debates about shale gas began, companies organized media campaigns to refute technical uncertainty and to stress the economic and geostrategic benefits. The QOGA organized public meetings and had a strong presence at the first public hearings in 2010. The experts put forward sought to reduce the controversy to issues of technological regulation and popular education.

> 'We think it is necessary to have an academic diploma and 20 years of experience to understand [the stakes of shale gas], now there are some people thinking they can understand everything after ten minutes on the Internet' (M. Binnion, CEO of Questerre Energy, *The Gazette*, February 2011).

Promoters were open to bargaining on both the regulation and the compensation (Fortin and Fournis 2013), but they lost credibility in the controversy; they lost credibility in particular, when they were unable to seal off leaks coming from 31 shale wells that a ministerial assessment discovered in early 2011. Montpetit and Lachapelle (2013) showed that the population favored information from ENGOs on this issue.

In France, promoters posed almost no resistance to statements that defined hydraulic fracturing as a threat. Only a handful of supporters took a public position in favor of shale gas in the media and it was already too late because the definition of the public problem stabilized in the first two months (Zittoun and Chailleux, forthcoming). The main line of defense presented hydraulic fracturing as a well-mastered technique and promoters stressed the need for exploration, but the policymakers, who faced a major social mobilization and had no political interest in hydrocarbons, were not convinced. The technical discourse was the main line of argumentation after the ban on hydraulic fracturing but it failed as well.

4.3. *Defining the legitimate policy solution: strategic uses of expertise*

During the process of public debate, policymakers used three strategies to limit the scope of legitimate expertise in defining the shale gas issue.

4.3.1. *Drafting the mandate and defining the inquiry*

The government-provided terms of reference to the appointed committees were the first step in the framing process because they determined the orientation of the coming inquiry. Three on four official French reports, published between 2011 and 2013, tended to confine the issue to a technological problem (Havard-Chanteguet 2011; CGIET, CGEDD 2012; OPECST 2013), not always on the technique itself but on the public's understanding of the technology. First, an administrative commission (CGIET, CGEDD 2012) worked on a technical assessment. Policymakers turned to a similar process from the GMO and nuclear energy debates. Second, a parliamentary commission (Gonnot-Martin 2011) adopted a wider perspective, but it did not have any impact because the legislative procedure bypassed it. Commissions were supposed to delay decision and cool down the social mobilization but they failed. Only the legislative mission (Havard-Chanteguet 2011) achieved an actual impact on policy change because it structured the political debates about the ban. The technique was at the core of the policy solution to stop the social unrest but the goal was first political. Therefore, the policymakers' frame of the French controversy was mainly related to a technological issue and confined other issues (governance, land planning, and energy transition). Moreover, all the reports supported the need of further exploration of the resources and experimentation of the technique, especially the OPECST's report, published in 2013, asking for the full implementation of the law which integrated experimentation.

In Quebec, the government turned to the renowned *Bureau d'Audiences Publiques sur l'Envrionnement* (BAPE), a semi-autonomous public body in charge of public debate about the environment and national land planning. The BAPE's first mandate in 2010 was only concerned with the 'sustainable development of the industry'. However, the report subverted the initial mandate suggesting it did not have enough data to made advises and orienting the controversy toward a Strategic Environmental Assessment (SEA) which started in 2011. The SEA (2014) and the second BAPE (2014) assessed the industry's global opportunity and impacts, advising reforming diverse policies (landplaning, royalties, environmental control) and outlining the poor practices of the shale gas industry compared to other extractive industries. Therefore, there is an expansion in the issue's frame.

4.3.2. *Selecting the experts and the sources*

Policy actors then oriented the issue's definition by appointing experts or members to committees. More globally, the source selection determined the reports' frame.

First, the choice of authors oriented the direction of the inquiry. French authors were mostly members of the parliament. Bipartisan authors, chosen for their knowledge and interest on the topic, drafted the following reports: Havard-Chanteguet (2011), Gonnot-Martin (2011), and OPECST (2013).[5] They referred mostly to administrative and legal documentation to support their conclusions on France's shale gas situation. Pro shale gas members of the parliament led the OPECST inquiry. They based their conclusions on administrative literature and elements of science, but also made extensive reference to industry-provided documentation. The CGIET/CGEDD[6] mission called upon administrative

experts but only one of them was an expert on subsurface industries. The authors disagreed on their conclusions because they represented different administrations (economy versus the environment). This informative process illustrated a technocratic frame of management of such controversy limiting the issue to experts and aiming at educating the public on the one hand. On the other hand, political authors, especially MPs Havard and Chanteguet, also defined the issue in political terms; they targeted political goals (stopping the unrest and scoring points against the opposition) within a technical frame.

On the contrary, the choice of authors in Quebec was based on their politically 'neutral' position. An autonomous administrative body with secure procedures led the two BAPE inquiries in Quebec. However, the SEA was controversial at its outset. It was not an institutionalized procedure in Quebec in 2011, so the government shaped the membership of its committee, the content of its studies, and its general frame of reference. Opponents denounced the committee as industry oriented because 8 of the 11 members were from gas companies and government agencies and the government did not grant a seat to ENGOs.

> I asked who studies water pollution risks? It was M. Every key issue was studied by the industry representative. There were 11 on the SEA committee and they trusted the only person with a bit of expertise who was from a gas company and who could concentrate the work and exclude specific questions opposed to her interests (Alternative Scientific Committee on Shale Gas 2014).

After months of protests, the Junex gas company representative left and a Friends of the Earth representative replaced him. A state-of-the-art bibliographical review supported all the Quebecois reports. Significantly, the second BAPE report featured fewer citations of literature that companies and associations produced and it distanced itself from the more partisan documents from both industry and ENGOs.

Second, the data from the sole scientific reference demonstrated the inquiry's main angles and the authors' main scientific frame (see Table 2).

Table 2. Proportion of scientific references according to source disciplines (% by column).

	Quebec			France			
Source disciplines of references	BAPE 2011	SEA 2014	BAPE 2014	GM 2011	HC 2011	CGIET CGEDD 2012	OPECST 2013
Public health	1.8%	1.5%	6.2%	9.1%	0%	6.7%	0%
Energy	2.7%	0.7%	0%	9.1%	**16.7%**	**13.3%**	4.9%
Hydrology	1.8%	3.7%	3.5%	0%	0%	0%	0%
Sociology	0.9%	2.9%	**7.1%**	0%	0%	0%	0%
Political science	0.9%	5.1%	**10.6%**	0%	0%	0%	0%
Law	2.7%	6.6%	8.8%	0%	33.33%	0%	0%
Risk management	0.9%	8.8%	10.6%	0%	0%	0%	0%
Economics	7.3%	10.3%	16.8%	0%	0%	20%	14.6%
Engineering	**13.8%**	**8.1%**	**4.4%**	**0%**	**0%**	**6.7%**	**53.7%**
Geosciences	**47.7%**	**22.1%**	**9.7%**	**54.5%**	**33.3%**	**33.3%**	**12.2%**
Hydrogeology	8.3%	13.2%	5.3%	0%	0%	0%	7.3%
Geochemistry-physical chemistry	0.9%	5.1%	1.8%	9.1%	16.7%	6.7%	7.3%
Others	10.1%	11.8%	15%	18.2%	0%	13.3%	0%
Total in number/ percentage	109/100%	136/100%	113/100%	11/100%	6/100%	15/100%	41/100%

French reports primarily quoted studies emanating from geosciences, engineering, and economics. These disciplines fit the main questions that the terms of reference posed: typically, the potential amount of resources (geosciences), the type of techniques used (engineering), and the economic value of the industry for the national economy (economics). The OPECST report appeared goal-oriented and selective because it ignored specific studies contradicting the report's objectives.

In Quebec, the scientific evidence that the government reviewed was more diverse. The SEA integrated 63 different research questions and a diverse range of scientists from universities, research centers, and ministries examining various aspects of the controversy. In contrast to the French OPECST mission, the SEA focused on controversial studies of methane leaks and highlighted this concern as a major issue: if there were significant methane leaks, this radically increased greenhouse gas emissions (SEA 2014). And very specific to the Quebec case, the government commissioned sociological and political studies to assess social acceptance and the state of public opinion and to draw a portrait of the social movement (Fortin and Fournis 2013; Bherer, Dufour, and Rothmayr Allison 2013; Montpetit and Lachapelle 2013). The second BAPE then used this wide-ranging assessment as a scientific basis. It showed the growing importance of sociological, political, and legal references in assessing the controversy and it was oriented toward different policy reforms.

4.3.3. *Limiting public participation*

The third strategy consisted of limiting public participation to inform the committees' work (see Table 3).

French officials chose which actors they wished to hear from and they mostly turned to industrials. In fact, the Havard-Chanteguet committee – the most influential report – mostly heard from gas company representatives. But despite those inputs, the legislative committee was responding to political pressure coming from both the government and the opposition. In France, public participation looked like more social mobilization. Social mobilization, media attention, upcoming elections,[7] and the propagation of a negative meaning tied to hydraulic fracturing helped convince the MPs that hydraulic

Table 3. Categories of public heard by the commissions.

	Quebec		France			
Type of public	BAPE 2011	BAPE 2014	GM	CGIET/CGEDD	HC	OPECST
Central administration	12%	21.8%	13.5%	6.1%	12%	10.7%
Foreign administration	10%	1%	15.1%	16.2%	0%	5.4%
Local administration	5.6%	12%	4.7%	10.6%	0%	11.8%
Representative/political party	1.5%	1%	4.8%	2.2%	4%	0%
Company/professional association	22.9%	12%	42%	34.1%	72%	49.5%
Research center/scientist	7.1%	7.1%	4.8%	15%	12%	19.3%
Individual	24.7%	25.6%	4%	0%	0%	0%
ENGO/local committee	11.5%	15.4%	10.3%	12.3%	0%	3.2%
Other	4.8%	4.1%	0.8%	3.3%	0%	0%
Total in number/percentage	393/100%	293/100%	126/100%	179/100%	25/100%	93/100%

fracturing was a threat. So, despite French reports' friendly description, argumentative works about hydraulic fracturing played beyond the confinement of the committees.

On the contrary, the Quebec consultative process included a wider public. The first BAPE featured strong participation from both coalitions. Fortin and Fournis (2013) showed that opponents' main claim was the issue of governance, and then environmental pollution. The following SEA assessed these claims. The second BAPE showed a drastic fall in company participation, which the low price of gas and low profitability of the 2014 Utica shale exploitation can explain. Nevertheless, the variety in the references and of the hearings showed that the controversy was not only about geology and technology but it was also wider in nature. In Quebec, official public participation shaped the controversy's orientation because the public trusted the BAPE despite its record of frequently approving projects submitted to it.

Finally, the choice, practices, and regulation of the commissions determined how the authors referred to the documentation and what kind of expertise they called upon. In Quebec, opponents participated in public hearings and reoriented the inquiry to include alternative questions. In France, the government mostly excluded opponents from the official commissions, which valued technical knowledge, so opponents choose a repertoire of other actions to gain policymakers' support for a ban.

4.4. *Dealing with uncertainty: strategic ignorance and politics of time*

Contradictions between the legitimization process of expert knowledge and the policy outcomes call for two arguments regarding the use of strategic ignorance and the politics of time.

4.4.1. *France: a ban precluding further exploration*

The French case demonstrates an uncommon use of strategic ignorance – and to a lesser extent of the politics of time. First, opponents precipitated the decision, curtailing the strategy of delay from the government. Even though, they used futurity frames (Metze 2018), it was not initially decisive in the policy change. But, they successfully generated a social and political pressure on the government, creating a political urgency, accelerating the policy process toward a ban, and curtailing technocratic assessment. The solution of the ban is determined by its ability to stop social mobilization, to overtake the opposition's bill claiming to prohibit hydraulic fracturing and to avoid law suits. Opponents then maintained their control over the agency of shale gas supporters in precluding exploration which was seen as a delay tactic. They blocked their schedule over experimentation and exploration phases. Politics of time favored the decision of a ban, but on the long term, opponents' futurity frames were also legitimated because the *Loi Hulot* of 2017, which forecast the end of fossil-fuel exploitation by 2040, was set in a context of climate change and energy transition the opponents initially defended. The 2017's bill legitimated the long-term ecological urgency over the short-term economic urgency.

Second, contrary to most of the literature (Hess 2016; Oreskes and Conway 2010), this is the social movement that made use of strategic ignorance to maintain their claim about contesting the extraction of shale gas. Although opponents mobilized alternative knowledge when contesting the shale gas licenses, once the ban was acted, they rejected any kind

of assessment of both shale gas resources and hydraulic fracturing. In fact, the law was ambiguous; it prohibited hydraulic fracturing and called for an annual assessment and for experimentation. MPs initially saw the ban as temporary and requiring further research. Therefore, some MPs and research centers advocated for the full implementation of the *Loi Jacob* and called for an exploration process to determine the amount of hydrocarbon resources in question and whether there was any need for the controversy (interview with UFIP, 2012). However, the Socialist government (2012–2017) only partially applied the law. Opponents' campaigns have headed off any start to experimentation.

> 'When they tried to authorize experimental hydraulic fracturing, it was with the idea of social acceptability. People resent this article of the law. This is why they are still mobilized. (…) The knowledge about the subsurface, this is their leitmotiv every time. Hollande said the same thing: we are not really remaining without knowing what is underneath our feet. And the day we could extract it in a clean and safe manner, why shouldn't we take advantage of it? Continuing the next 150 years with hydrocarbons is not possible. That's why we are saying no to all hydrocarbons in France.' (interview with Collective, 2012)

Opponents also asserted that exploration was not self-sufficient and that it favored exploitation. Within the government, the Minister of Ecology persuaded the leftwing President that he could not risk to appear less environment-friendly than its rightwing predecessor. As a result, the government has only granted a handful of exploration licenses since 2011. By maintaining the assertion of geological uncertainty, they blocked any assessment of the economic value and geostrategic impacts of a French shale industry (the Energy Information Agency suggested in 2011 that France had the second largest shale deposit in Europe). Therefore, opponents precluded the construction of new statements about shale gas's economic opportunity while they expanded their own claim about phasing out of all fossil fuels. The French case thus demonstrates that strategic ignorance was a great political resource for the organized civil society.

4.4.2. *Quebec: an important assessment producing minor policy change*

The Quebec case demonstrates on the contrary a quite classical use of both strategic ignorance and politics of time. First, despite a thorough assessment of the industry, policy changes did not reflected the outcomes of the production of new knowledge. All inquiries questioned the shale gas industry in its social acceptability, its profitability, and its environmental risks. However, officials mostly used statements about social acceptance and economic benefits when they discarded the industry, leaving the critiques about the techniques aside (as PM Couillard stated in various interviews). The government left the policy about hydrocarbons quite unchanged except for minor adjustments. The government reformed subsurface mineral rights in 2013 to allow municipalities to exclude some areas from mining prospection. However, it supported shale oil exploration on Anticosti, a remote island in the Gulf of Saint Lawrence, reforming the water intake regulation in 2014 to restrict the use of hydraulic fracturing in populated areas but to authorize it in remote areas. The reform dismissed some of the warnings from the SEA (2014) about false cementation, safe distances, and technological uncertainty. A civil servant explained that they relied on other professional and scientific publications. The Liberals then passed the *Loi sur les hydrocarbures* (oil and gas regulation) in 2016 which reproduced the subsurface mineral rights.

Second, the government used the production of expert knowledge to delay decision-making and exhaust the opposition. Facing potential contestation over multiple oil and gas projects (Anticosti, Gaspesie, Gulf of Saint Lawrence, Energy East pipeline), the successive governments launched SEAs to evaluate both the potential resources and risks. This strategy enabled the continuation of industrial projects while the scientific assessment was under way. In fact, assessments occurred alongside exploration, and in the case of Anticosti, CAN$115 million of public funding went into shale oil exploration. It gave time to demonstrate profitability, which they failed due to the 2014 drop in oil prices. More than a dozen environmental assessments, public and parliamentary hearings regarding oil and gas occurred between 2010 and 2016. Most of the projects failed but they all necessitated the mobilization of ENGOs and local committees to contest the initial political support. Opponents proposed policy alternatives related to renewable energies, shutting the door to any new fossil fuel exploitation, but the government mostly eluded these alternatives. Policymakers defined the failure over shale gas as a governance failure (initial haste, absence of consultation and regulatory frame) rather than a bad policy orientation.

5. Conclusion

Crossing STS and policy analysis, the article showed that coalitions and the government used expert knowledge to legitimize their policy statements, orient the policy frame or delay decision-making. Their success is tied to the choice, practices, and regulation of the commissions in charge of assessing the issue. The political uses of expertise are not an infamous utilization of knowledge and ignorance; they rather allow consideration of the entire network of actors, statements, and resources needed to support the definition of a public problem and its solution. Expert knowledge played an important legitimating role, but not in the conventional role of knowledge provision and detached evidence-based policy-making. Policy decisions were mostly determined by imposition of a dominant meaning, economic and political interests, level of mobilization, and electoral calendar.

The article asserted the use of strategic ignorance is not only the doing of powerful actors; social movements are also able to curtail the production of knowledge to support and maintain their own environmental claims. While the Quebec case showed a selective use of knowledge from the government in reforming oil and gas related policies, the French case demonstrated how opponents were able to preclude exploration and thus the production of credible economic estimates from shale gas promoters. Politics of time also played an important role in shaping policies because they accelerated or slowed down the pace of the debate, favoring some actors over others. The acceleration of the controversy in France played in favor of the opponents because the debate was not so much about impact studies but more about a political choice in a context of spreading social unrest. On the contrary, the government was able to slow down the pace of the controversy in Quebec with an environmental assessment. It did not enable yet the development of the shale gas industry, but the tactic of delaying decision with long assessment enabled other oil and gas projects to go along while opponents were busy supporting their claims in various forums.

Even though the article concludes on the weak influence of expert knowledge on policy decision, the research did not look at the potential shift within administrative expertise. The marginal impact of external expert knowledge in policy-making could hide internal transformations. There is no hint that leads the author to think that the internal expertise experienced a major modification, but it is possible that administrators adapted to their critics and attempted to integrate new areas of expertise, such as social acceptability. In fact, this trend is present in Quebec through the Ministry of Natural Resources work in 2016 to examine social acceptability (MERN 2016).

Notes

1. While Quebec is a Canadian province, it has a regulatory authority over energy and the environment similar to France. The federal strata played the same role as the European Union for France, that is providing expert knowledge, but it did not have an important impact on national/provincial debates.
2. Another set of 22 interviews with key French policy actors was made available from collaboration on the topic of shale gas in France.
3. In France, many MPs were at the same time mayors or local officials.
4. Statement of the Prime Minister Charest in late 2010.
5. Office Parlementaire d'Evaluation des Choix Scientifiques et Techniques: parliamentary office assessing scientific and technical choices.
6. Conseil Général de l'Industrie, de l'Energie et des Technologies (General Council of Industry, Energy and Technology, CGIET) and the Conseil Général de l'Environnement et du Développement Durable (General Council of the Environment and Sustainable Development, CGEDD).
7. Three elections mattered for MPs to support the ban (the regional election of March 2011 marked a severe defeat for the government, the *cantonal* election of September 2011, and general election of April 2012 increased political attention to the problem), but none of them determined the decision.

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