EPISTEMIC COMMUNITIES, POLICY MAKERS, LEARNING AND CONTROL OVER KNOWLEDGE: TOWARD A TYPOLOGY

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ABSTRACT
For the past two decades many scholars in the fields of IR, comparative politics and policy analysis have identified epistemic communities as key actors in the transfer of knowledge into decision-making. Despite the obvious resonance of the idea, the conceptual issues that the framework raises still lack systematic investigation. Specifically, little is known about the central problem of epistemic community-policy maker relations, namely the analysis of control over knowledge production and policy learning. Two revisions to the framework are suggested here which can both accommodate and conceptualize learning variation. First, it is proposed that the causal dynamics identified by Haas are given equal billing. By treating uncertainty, interpretation and institutionalization as ‘multiple streams’ (Kingdon, 1984) that either by themselves or in combination explain what conditions epistemic communities’ emergence and influence, analysis is opened to cases where the knowledge asymmetries between epistemic communities and policy makers are less pronounced than in the framework’s original formulation. With the empirical scope of the framework increased, we need to appreciate the epistemic resources available to both epistemic communities and policy makers and the implications this may have for how learning proceeds. With this in mind, the second revision adapts an existing typology of adult learning (Mocker and Spear, 1982) to disaggregate the control over knowledge enjoyed by epistemic communities and policy makers into distinct categories of epistemic means and policy ends. The usefulness of the revised model is explored through its application to a comparative study of US and EU policy makers’ interaction with the epistemic community that formed around the regulation of the milk yield enhancer bovine somatotrophin (rbST). The findings offer affirmative prima facie evidence on the compatibility, analytical relevance and stretchability of the learning extension.

KEYWORDS
Bovine somatotrophin (rbST); biotechnology; epistemic communities; knowledge production; learning; regulation.
INTRODUCTION

Almost two decades ago, Peter M. Haas (1989, 1990, 1992a) formulated the epistemic communities framework as a means of exploring the influence of knowledge-based experts in international policymaking. Specifically, the approach was designed to address decision-making instances characterized by technical complexity and uncertainty. Control over the production of knowledge and information enables epistemic communities to articulate cause and effect relationships and help to frame issues for collective debate, propose policies and identify key issues for negotiation (1992a: 2). By teaching policy makers new patterns of reasoning, these expert enclaves can help state actors overcome collective action problems and in doing so become key determinants in international policy coordination (1992a: 3).

Scholars across political science have readily adopted the idea using the nomenclature of epistemic communities as a metaphor to describe various types of knowledge-based policy networks and committees. It is surprising then that despite the presence of empirical studies using the idea of an epistemic community in different ways and in conjunction with different approaches (Meijerink, 2005), only in a handful of studies have related any findings back to framework itself (Dunlop, 2000; Radaelli, 1995; Zito, 2001). Significantly, none of these interventions address the central mechanism that underpins epistemic communities’ influence – the ability to assume control over knowledge production and policy maker learning.

It is proposed that the arrested development of the learning exchanges between epistemic communities and policy makers is rooted in the narrow range of case studies to which the framework can be applied. With policy maker uncertainty presented as a necessary condition for epistemic communities’ entry into the policy arena, the framework as it stands only explores cases where policy makers experience extreme knowledge deficits. This does not capture the variety of learning exchanges that occur between policy makers and experts. While it is clear that epistemic communities can induce changes in state interests under conditions of uncertainty (for example Haas, 1992b), policy makers are not always situated behind an all encompassing veil of ignorance (indeed arguably a more common problem is information overload). We know from the knowledge utilization literature than even when technical uncertainty associated with an issue is high, policy makers may know their own policy preferences and experts called upon required to offer advice on discrete technical aspects of an issue (Weiss, 1979). Epistemic actors are also brought together by policy makers to advise them in situations where their technical rationality is relatively unbounded and their role is to legitimize and endorse learning that has already taken place rather than directly feed into policy makers’ thinking (Lipsky, 1977). Such variation in epistemic communities’ ability to assume control over policy makers’ learning matches the often politicised circumstances in which these groups of experts are engaged where learning stimulated by them at one time or place can be contested in another.

The aim of this paper is to explore possible ways in which we can expand both the empirical reach of the epistemic communities framework and the conceptualization of learning that underpins their interactions with policy makers. How can the variety of ways in which epistemic communities influence policy makers’ belief systems be captured by the framework? How can conceptualise the learning exchanges where epistemic communities
advise policy makers that possess their own knowledge and have other epistemic resources at their disposal? Specifically, how can we model the different levels of control over learning enjoyed by epistemic communities and policy makers? Two revisions to the framework are suggested here which can both accommodate and conceptualize learning variation. First, it is proposed that the causal dynamics identified by Haas are given equal billing. By treating uncertainty, interpretation and institutionalization as ‘multiple streams’ (Kingdon, 1984) that either by themselves or in combination explain what conditions epistemic communities’ emergence and influence, analysis is opened to cases where the knowledge asymmetries between epistemic communities and policy makers are less pronounced than in the framework’s original formulation. With the empirical scope of the framework increased, we need to appreciate the epistemic resources available to both epistemic communities and policy makers and the implications this may have for how learning proceeds. With this in mind, the second revision adapts an existing typology of adult learning (Mocker and Spear, 1982) to disaggregate the control over knowledge enjoyed by epistemic communities and policy makers into distinct categories of epistemic means and policy ends. The usefulness of the revised model is explored through its application to a comparative study of US and EU policy makers’ interaction with the epistemic community that formed around the regulation of the milk yield enhancer bovine somatotrophin (rbST).

The central aim of this paper is to contribute to the development of the ‘reflective research programme’ around epistemic communities that Haas and his colleagues originally hoped to precipitate (Adler and Haas, 1992). Rather than re-invent any wheels, the interest is to make ‘smart revisions’ that maximize the resources available within the epistemic communities framework and that exist in the well established research on adult learning in the education literature. The first section of this paper sets out the epistemic communities approach where the causal logic is relaxed and outlines the learning extension. The potential usefulness of these revisions requires empirical investigation; section two of the paper uses the comparative case of rbST’s regulation in the US and prohibition in the EU to explore the utility of the model in three respects. The third and concluding section summarizes the findings and the contributions made by the learning extension and sketches a future research agenda.

SECTION ONE: EPISTEMIC COMMUNITIES AND CONTROL OVER LEARNING: AN ANALYTICAL FRAMEWORK

So far the epistemic communities framework has bucked the academic convention of theoretical reformulation through empirical investigation and critique – for example similar approaches of policy communities and the advocacy coalition framework have been the subject of extensive revision spanning decades. While nearly two decades after the concept was first unveiled the concept enjoys good currency in metaphorical terms, the actual number of studies applying the full framework outlined by Haas remains modest. As a result, key issues concerning the ways in which policy makers and epistemic communities interact with one another lack conceptualisation. Specifically, little attention has been given to the way in which policy makers learn from epistemic communities and the scope of these principal
teachers control over the knowledge that develops around an issue. The reasons for this
absence of iterative development and conceptual refinement are explored in this section and
revisions to the framework proposed.

1.1 EPISTEMIC COMMUNITIES EMERGENCE AND UNCERTAINTY:
NECESSARY OR SUFFICIENT?

Epistemic communities are the amalgam of professionals working across the social and
natural sciences that possess a specific blend of beliefs covering four elements:

[1] a shared set of normative and principled beliefs, which provide a value-based
rationale for the social action of community members; [2] shared causal beliefs,
which are derived from their analysis of practices leading or contributing to a central
set of problems in their domain and which then serve as the basis for elucidating the
multiple linkages between possible policy actions and desired outcomes; [3] shared
notions of validity – that is, intersubjective, internally defined criteria for weighing
and validating knowledge in the domain of their expertise; and [4] a common policy
enterprise – that is, a set of common practices associated with a set of problems to
which their professional competence is directed, presumably out of the conviction that
human welfare will be enhanced as a consequence (Haas, 1992a: 3).

It is this blend of beliefs that distinguishes epistemic communities from interest groups and
policy networks (Haas, 1992a: 22) and gives them the potential to occupy the elevated
position of ‘principal teacher’ to policy makers. Thus to be defined as an epistemic
community, all four beliefs must be embodied in an identifiable group of experts in the
political arena. These exacting criteria and their ‘anthropomorphic’ character (Radaelli, 1997:
169) mean that in methodological terms the task of ‘[a]ctually identifying these communities
can be a very difficult process’ (Wright, 1997: 11) and one which depends on painstaking
empirical research (Haas, 1992a). Moreover, the highly specialized nature of these
communities ensures that the actual research market for them is necessarily a niche one; their
ability to make credible claims to authoritative knowledge makes epistemic communities rare
by definition.

Clearly epistemic communities are not as numerous as policy networks or advocacy
coalitions; however the potential for market growth in this niche has been stifled by the
causal logic attached to these actors’ entry to the policy process. Epistemic communities’ role
in policy-making is mediated by three causal dynamics: uncertainty, interpretation and
institutionalization (Haas, 1992a). In the framework’s original formulation, these independent
variables operate through a sequential logic. High levels of uncertainty about the technical
aspects of an issue, often signalled by policy failure or crisis, stimulates a call from policy
makers to experts for assistance (1992a: 14); armed with epistemic interpretations of the issue
that are accessible policy terms to policy makers epistemic communities may insinuate
themselves into the policy arena and, by helping policy makers think in ways they may not
have anticipated, shape policy and over time even achieve some measure of
institutionalization for themselves or their ideas. While this sequence is not always completed – notably, epistemic communities often fail to become insinuated into bureaucratic structures (Adler and Haas, 1992) – their ability to occupy the role of principal teacher to policy makers is governed by a law of acceleration with high levels of uncertainty as the first and necessary injection of fuel.

The fact that high levels of technical uncertainty are posited as the necessary condition for epistemic communities’ emergence and occupation of a privileged role in policy maker learning is rooted in the framework’s inductive development in relation to cases of international policy coordination. By making epistemic communities’ entry to the policy arena a function of policy makers’ knowledge deficiencies policy maker learning across an issue appears to be passive and one-dimensional and knowledge use instrumental (Weiss, 1979). Technical complexity should not be conflated with comprehensively bounded rationality however. Moreover, the desire to fill knowledge deficits need not be the prime motivation behind policy makers’ engagement with an epistemic community. While Haas raises the possibility that the epistemic communities may legitimate political preferences (1992a: 16), the importance of uncertainty forecloses the analysis of cases where learning is symbolic or strategic (Weiss, 1979). The emphasis on the role of uncertainty as a key determinant of epistemic communities’ ability to stimulate international policy coordination also detracts from the fact that these groups’ influence may be spatially and temporally contingent with policy maker learning partial or non-existent in some instances.

If it is to explain ‘who learns what, when, to whose benefit and why’ (Adler and Haas, 1992: 370), the variety of roles epistemic communities may play needs to be implied in the construction of the framework and analytical tools provided that conceptualise the different learning exchanges that are possible. Two revisions are proposed here. The first is that the importance of uncertainty for epistemic communities’ emergence be relaxed. By treating uncertainty, interpretation and institutionalization as multiple causal streams (Kingdon, 1984) that either separately or in some combination mediate epistemic communities’ entry into the policy arena, we can achieve a more interactive account of their relationship with policy makers and explore the variety of roles they have in policy makers’ learning and policy diffusion across time and space.

This relaxation of the framework is one which has already been put into practice albeit implicitly by those authors selecting case studies where uncertainty is low (notably Verdun, 1999). The explicit revision suggested here enables us to open-up the approach in a more systematic manner. Uncoupling the three causal dynamics that mediate epistemic communities’ entry and involvement in the policy process captures the disorder and complexity that often characterizes policy-making in general. In relation to complex technical issues specifically, it acknowledges the dynamic relationship that exists between knowledge and power where control over aspects of learning may not reside in the hands of a single actor for long.
1.2 MODELLING EPISTEMIC COMMUNITY-POLICY MAKER LEARNING EXCHANGES

The key dimension of learning in the epistemic communities framework concerns these actors’ control over the production of knowledge around an issue. While epistemic communities’ central role in information production and paradigm construction gives them the authoritative status to occupy the role of principal teacher to policy makers, we cannot assume that they will be able to exert control over every aspect of what is known about an issue. By acknowledging the variety of access points through which epistemic communities enter the policy arena and the complexity of their interactions with policy makers, we open-up the approach to a wide range of learning situations where control over knowledge is dynamic rather than fixed thereby transforming how they relate to one another. How can these situations be understood? Specifically, how can we model the different levels of control over different aspects of knowledge assumed by policy makers and epistemic communities?

To address these questions, a second revision is suggested that adapts an established model of learning for use within the epistemic communities framework.

The academic ‘renaissance’ of the role of ideas in the policy process of which epistemic communities was a key feature (Radaelli, 1995) also heralded the development of the concept of policy learning. This literature has struggled to move beyond the seminal contributions made over thirty years ago however (most notably, Braybrooke and Lindblom, 1963 and Heclo, 1974). One of the main problems here is that despite the potential synergies with literatures elsewhere – most obviously in psychology, management and education – the study of policy learning is remarkably parochial. While aspects of the study of policy analysis are relevant – most notably the literature on knowledge utilization – the lack of lesson-drawing from the established and arguably more specialist literatures may explain why policy learning tends to be defined broadly. For example, two leading authors in the field describe it as ‘a process in which knowledge about policies, administrative arrangements, institutions etc. in one time and/or place is used in the development of policies, administrative arrangements and institutions in another time and/or place’ (Dolowitz and Marsh, 1996: 344). The result has been a rather basic set of analytical tools and lack of specification of the key dimensions of knowledge acquisition processes (see James and Lodge, 2003 for an excellent critique).

The issue of control over knowledge production is explored using broad notions of endogenous lesson-drawing (Rose, 1991 for a rational account and Braybrooke and Lindblom, 1963 for an incremental one) and exogenous policy transfer and coercion (Dolowitz and Marsh, 1996; Heclo, 1974: 305-6). While such categories are useful in providing an overview of learning amongst multiple actors in the policy arena they need to be unpacked further if we are to understand the variety of learning situations that are possible between policy makers and epistemic communities. A model is required that explores knowledge production as an interactive and differentiated process in which teachers and learners exert different levels of control over different aspects of knowledge across time and space. The literature on adult learning provides such a model.
While learning can be the simple and passive adoption of what others know, nearly four decades\(^1\) of research on lifelong learning illustrates that adult learning is more commonly an interactive affair where learners become directly involved in aspects of knowledge creation (Lave and Wenger, 1991; Sfard, 1998). Echoing socio-cognitive models of learning, teachers’ ability to control and guide learning is mediated as much by the existing bank of knowledge held by learners and their social context as it is by any expert’s own professional expertise. The human mind and the organizations in which they become aggregated are not a blank slates; learning is heavily conditioned with new information filtered through existing internal representations (Brown, 1995; Denzau and North, 1994; Tolman, 1948) and the socio-political and institutional ‘lifespaces’ inhabited by learners (Argyris and Schön, 1978; John-Steiner, 1997; Lewin, 1951). When they learn, humans engage in a cathetic process investing both cognitive and emotional energy. Given this, knowledge updates are not necessarily processed in a rational Bayesian manner, where out-dated information is updated or bad ideas ‘unlearned’ (see Rushmer and Davies, 2004 on unlearning), nor need they actually lead to any change in behaviour.

Acknowledging the micro-foundations of learning in a socio-cognitive sense sets the scene for a more nuanced account of control over knowledge production. As Haas suggests, what is known about an issue is not a unified good but rather is made up of different components. While by definition epistemic communities must possess four components of knowledge around an issue, in their learning exchanges in the policy arena there is no guarantee that policy makers will take an equal interest in all four. Indeed, it is perhaps more likely that policy makers will attend to some components more than others. What are the central dimensions of control over knowledge in relationships between epistemic communities and policy makers? In their model of adult learning, Mocker and Spear (1982) argue that analysis must distinguish between control over what is to be learned in terms of a subject’s epistemic content – means – and the ends to which those means are directed. The four components identified by Haas can be reclassified quite simply into these dimensions of knowledge control: shared normative beliefs (component 1), cause and effect postulates (component 2) and intersubjective understandings of validity (component 3) make up the epistemic means produced around an issue and the most overtly political component of epistemic communities the common policy enterprise (4) equates with the end objectives. Along with its potential fit with the epistemic communities framework, this distinction is significant as it challenges the assumption made in policy literature that there exists a positive correlation between control over substantive knowledge and the identification of policy goals\(^2\).

The distinction between the control over knowledge means and ends experienced by teachers and learners results in a simple two-by-two matrix in which Mocker and Spear (1982) position four different types of learning: self-directed learning, informal learning, formal learning, and non-formal learning (figure 1 provides a schematic illustration). The relationship between teacher and learner revolves around their control over knowledge

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\(^1\) The seminal study into ‘lifelong education’ as it was then known was published by the UNESCO Institute for Education (UIE) in 1972 by Faure et al.

\(^2\) James and Lodge criticize the policy transfer model presented by Dolowitz and Marsh (2000) for collapsing these two analytical dimensions onto a single continuum (2003: 184-5).
production and is conditioned by their socio-cognitive context; it is not related to either the subject matter that is being taught or the instructional techniques deployed by teachers or the setting in which learning occurs (see Faure et al, 1972 for more on this distinction between aspects of learning and of education). So for example, while the subject matter may dictate that learning takes place in an unconventional setting, the balance of control over knowledge production between teacher and learner may still ensure that learning is formal (Seaman and Fellenz, 1990). The four are discussed in further detail below where they are related to epistemic community-policy maker learning exchanges.

- **Self-directed learning** is individualized and experiential; learning by doing (Boud, 1985; Jarvis, 1987; Kolb, 1984). Here, learning is unstructured and driven by the epistemic curiosity and objectives of the learner. With their learning unrestricted by any disciplinary silos or paradigms, learners enjoy control over all aspects of learning seeking out knowledge from a variety of sources and establishing their own belief systems – ‘learning what they want for as long as they want and stopping when they want’ (Rogers, 2004). Knowledge creation here is not entirely autodidactic learners will often take advice from a range of teachers on the veracity of the information they find (Hiemstra, 1994). They do not however identify with a single actor as a principal teacher. The avoidance of single paradigms to structure what they learn implies that where policy makers direct their own learning epistemic communities may simply become one possible information source among many or may be shut out altogether.

- **Informal learning** accounts for majority of everyday human learning (Lewin, 1951; Rogers, 2003). Here learners are task-conscious and learning revolves around assembling the means and developing the know-how to dispatch a task which has been set for them (Rogers, 2003: 18-21). Thus learners’ freedom and scope for choice centres upon the epistemic resources they wish to attend to in order to meet pre-existing targets set by teachers. In relation to policy makers and epistemic communities, informal learning would describe circumstances where an epistemic community had set policy targets or standards that policy makers had to satisfy.

- **Formal learning** refers to externally imposed learning where the learner’s control across both epistemic means and policy ends is severely constrained (Coombs and Ahmed, 1974). Here learning takes the form of guided episodes from teacher to learner. This captures the type of learning and locus of control between epistemic communities and policy makers posited by the original framework where the epistemic community assumes the role of principal teacher as the result of policy makers’ knowledge deficits.

- **Non-formal learning** refers to organized, systematic learning where information is molded to learners’ own circumstances and the teacher’s role is that of instructor (Merriam and Caffarella, 1999). Here, learners’ awareness of what they want to do with what they learn ensures that their engagement with codified knowledge is mediated by pre-existing expectations for determining the use or success of that knowledge (Heimlich, 1993; Tough, 1971). In relation to epistemic communities and
policy makers, an epistemic community may control key resources that determine how learning around an issue proceeds but not the ends to which those resources are directed. It should not be assumed however that learners will always receive the epistemic means they require to achieve their goals. In the education literature, non-formal learning exchanges are often failed cases of formal learning where the learner has not conformed to teachers’ goals or goal-oriented structures have been absent or unclear (Pigozzi, 1999). The result can be a mismatch between the knowledge teachers are willing and able to impart and the information learners need in order to achieve their personal goals. So for example, policy makers may commission a piece of research or consolidate an epistemic community within a bureaucracy but may be less able to exert influence over the nature and timing of the epistemic resources that are delivered.

Control over the production of epistemic means and policy ends is conceived of as a process. As such, learning exchanges between policy makers and epistemic communities are temporally and spatially contingent with the evolution and alteration of learning styles mediated by events associated within some or all of the three causal streams of uncertainty, interpretation and institutionalization which affect what teachers and learners know about an issue and what is perceived as relevant about an issue.

The aim here is to explore the extent to which the control over knowledge typology of learning captures the variety of relationships that are possible between epistemic communities and policy makers. Three aspects of the model’s utility are probed empirically:

1. the model’s compatibility with the epistemic communities framework’s causal dynamics and focus on cross-spatial, cross-temporal case studies;

2. the extent to which the distinction between epistemic means and policy ends is analytically relevant in that it illuminates the central issues that underpin epistemic community-policy maker interactions, and

3. the extent to which the model is stretchable and enables analysis of any variants of learning exchanges found within the four categories.
SECTION 2: EXPLORING THE TYPOLOGY: LEARNING IN THE US AND EU IN THE REGULATION OF BOVINE SOMATOTROPHIN

The viability and usefulness of this learning model is explored through an empirical examination of the relationship between policy makers in the US and EU and the epistemic community promoting the milk yield enhancer – bovine somatotrophin (rbST). Analysis follows a ‘process tracing’ approach (George, 1997) with the account informed by actors’ perceptions of the control over epistemic means and policy ends identified using interview data, scientific reports and official documentation. The aim of analysis is to make a conceptual contribution to our limited knowledge of epistemic community-policy maker interactions in general and how the learning exchanges between these actors evolve and differ across time and space in particular.

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3 The author conducted thirty-eight semi-structured interviews with active and retired scientists, civil servants, industry representatives, politicians and interest group actors.
rbST is a genetically modified milk aid. In short, bovine somatotrophin is a naturally occurring substance that, with the advent of biotechnology in the 1970s in the United States (US), was synthetically produced for the mass market of dairy farmers. rbST was developed and tested by an epistemic community of agricultural economists, biotech scientists, veterinary experts, toxicologists and lawyers associated with pharmochemical manufacturer Monsanto and its university partners – notably Cornell University’s Department of Animal Science. These actors were united by a normative belief that the product should go to market as it promised dairy farmers greater flexibility in how they managed their herds, a certainty that milk yields could be increased by rbST safely, shared values on the centrality of quantitative risk assessment methods in assessing and evaluating the product and finally a policy aim to get rbST to market by the end of the 1980s at the latest.

In both cases, policy makers learned about rbST however only in the US case was the epistemic community able to adopt an influential role. This section outlines the regulatory review of rbST in the US and EU that spanned nearly two decades. The story is structured by the four mechanisms identified through which epistemic communities are expected to engage policy makers in learning and exert influence: policy innovation; policy diffusion; policy selection; policy persistence (Adler and Haas, 1992).

2.1 POLICY INNOVATION

Policy innovation captures the early stages of epistemic community-policy maker exchanges where the epistemic community aims to frame the range of political controversy, define state interests and set standards for how the evidence on an issue is to be evaluated (Adler and Haas, 1992). Such formal learning did not prevail in the case of rbST however. The product’s scientific development ran concurrent to the establishment of a regulatory framework on biotechnology in the US. Convinced of the huge commercial potential of these innovations and the scientific safety of the technology, the Food and Drug Administration (FDA) took the lead role in establishing a cross-agency ‘co-ordinated’ regulatory framework. The policy goal here was clear, the FDA was committed to getting flagship biotech products such as rbST approved for market as quickly as possible (Miller, 1988) providing that product safety and efficacy could be established by product developers.

Accordingly, the early engagement between the rbST epistemic community and the FDA’s Centre for Veterinary Medicine (CVM) bore the hallmarks of non-formal learning. In 1982, the first investigational application was submitted for rbST and the epistemic community began conducting field and clinical trials of the product (Miller, 1988). The product review process followed the iterative norms of knowledge production institutionalized in the US regulatory framework – with the epistemic community engaged in ongoing discussion and providing additional data when the CVM requested (Juskevich and Guyer, 1990). Indeed, the application alone amounted to over 55,000 pages of studies and analysis leading CVM director Gerald Guest to conclude that rbST would be the most extensively studied product the agency had ever handled (in Gibbons, 1990: 852).
This is not however the whole picture of learning. While CVM policy makers’ learning about rbST was non-formal, at certain points it was tinged with self-direction. One particular episode is instructive in this regard. An increased incidence of the udder infection mastitis among dairy cows injected with rbST was detected in trial data. Mastitis is viewed universally amongst dairy farmers as the most financially costly disease they face because of the intensive antibiotic treatment it requires and the corresponding possibility of lost revenue from spoilt milk (Bramley and Dodds, 1984). Clearly, the threat of a positive correlation between the administration of an rbST product and an increased incidence of mastitis was potentially very damaging for the prospects of the product’s uptake in the dairy industry. While academic veterinarians both from within and beyond the epistemic community (Bauman, 1990; Kronfeld, 1987) agreed that multi-lactational studies were required into the link between rbST and mastitis, neither the epistemic community nor the CVM believed that the licensing process should be held up by such research (Deakin, 1990). With both sets of actors aware of the potentially infinite costs of the product review process and the target that had been established that the product would reach the market by 1990 (interview; Deakin, 1990), the CVM preferred to convene a subcommittee of the Research Committee of the National Mastitis Council to develop guidelines for the evaluation of mastitis levels in the trial studies to enable it to evaluate the findings before any additional studies were commissioned.

2.2 POLICY DIFFUSION

The framework suggests that epistemic communities’ innovations are diffused through communication with scientific colleagues beyond the nation state through conferences and specialist literatures. The epistemic community’s aim here is to engage with experts occupying similar positions to their own in ways that enable these new actors to cascade ideas down to and ‘exert concurrent pressure’ on policy makers at their local level (Adler and Haas, 1992: 379). This is, of course, an ideal typical account of knowledge transfer between elites and Adler and Haas readily acknowledge that in reality we should expect the process to be far messier and politically contingent than this stylised description suggests (1992: 379). Indeed, the rbST case confirms that epistemic communities that are successful teachers in one place may not be able to assume the same status in another. Despite the hostile reception in EU to the epistemic community’s interpretation of rbST as an attractive and safe product, knowledge transfer was not absent. Rather, a sub-optimal form of transfer occurred. Policy makers directed their own learning in part by selectively attending to outlier evidence from the rbST trials conducted by the epistemic community to bolster their own policy objective to prohibit use of the substance indefinitely.

The interpretative context surrounding rbST in the EU created the conditions for self-directed learning among policy makers and effectively blocked the epistemic community from engaging policy makers in any sustained learning exchanges. In 1987 when the first product applications were submitted in the EU, the policy debate about biotechnology was in its infancy and dominated by concerns from environmentalists that claims of the scientific safety
of rDNA technology were not robust and that, in normative terms, it posed unnecessary threats to the ‘European way of life’ (Bud, 1993: 207). Such an environment would represent a tough challenge for any epistemic community aiming to help policy makers learn about its biotech innovation however in this case the barriers were raised higher still. By boosting milk production, rbST would hit what was arguably the weakest link in the Community’s enervated agricultural policy (Gardner, 1996: 65). Indeed, in their first contact with Monsanto members of the epistemic community in 1984, European Commission officials from DG Industry pointed out that the introduction of the milk quota system that year made a yield enhancer a very poor fit for the EU in policy terms (Cantley, 1995: 635; interviews).

While the US had worked through similar debates in the 1970s ‘gene wars’ these had been succeeded by a regulatory infrastructure underpinned by a strong biotech lobby, supportive scientific community integrated into industry and quantitative risk assessment techniques all of which were fundamentally supportive of the pedagogic efforts of science-based epistemic communities such as that which existed around rbST. In the EU however, there was no established network of experts working on biotech able to act as idea conduits, nor was there a science-based regulatory framework. Rather, rbST was assessed on the basis of its’ potential socioeconomic and environmental impacts as well its safety, quality and efficacy in scientific terms (Commission, 1989). And so, while the rbST epistemic community engaged the independent scientists on the Committee on Veterinary Medicinal Products (CVMP) in a thorough and iterative process of formal learning, this committee’s conclusion that rbST products were safe was not binding (Commission, 1991, Commission, 1992: annexes 1 and 2).

Between 1988 and 1994, rbST was under review and the subject of successive moratoria prohibiting its use within the Community. Despite efforts to engage sceptical policy makers (EP, 1988; interviews), the epistemic community failed to gain a foothold during this ‘review period’. The almost annual renewal of the moratorium was justified by the need to gather further evidence on the substance. Policy makers in DG Industry (with the support of the European Parliament’s Environment Committee) assumed the role of self-directed learners collecting evidence focussed upon the risks associated with rbST’s socioeconomic impact and implications for animal welfare and consumer confidence to construct an alternative paradigm. The result was a further moratorium set until 2000. While the development of this belief system by EU policy makers has been documented in detail elsewhere (Dunlop, 2007), of obvious relevance here is what happened to the epistemic means proffered by the epistemic community. DG Industry contested the epistemic community’s interpretation of the rbST as safe for animals citing the community’s own data on mastitis (Commission, 1992, 1993a, 1993b). Unlike their counterparts at the CVM, the Commission officials were not scientifically trained but rather were civil servants willing to contradict the interpretation of the pre-eminent knowledge creators and significantly their own scientific advisors. The fact that policy makers were confident enough to make these scientifically based arguments is indicative of the low level of respect enjoyed by the epistemic community in the EU and the relative nature of scientific interpretations and authority.
2.3 POLICY SELECTION

Adler and Haas (1992: 381) acknowledge that in cases where uncertainty is low, the ultimate policy chosen is a function of political ‘fit’ between an epistemic community’s belief system and those of policy makers. The expectation here is that where there is resistance, epistemic communities will aim to make their ideas more politically palatable by adapting their message to particular domestic circumstances. Despite the expectation within the CVM and epistemic community that rbST would reach the US market by 1990, questions raised by individuals in the scientific community about trial evidence of deleterious impact of rbST for both animals and humans resulted in wider government attention and specifically two Congressionally mandated audits of the CVM’s review of rbST (OTA, 1991; GAO, 1992). These challenges are notable not simply because they effectively delayed rbST reaching the market for a further four years but also because it was the CVM and not the epistemic community that sought to address them. Defending their policy decision that rbST be granted a license, policy makers at the CVM were transformed from learners to teachers explaining and defending the epistemic means that had been given to them by the epistemic community.

One episode exemplifies this transformation. In the late 1980s, Samuel Epstein a Professor of Occupational and Environmental Medicine at the University of Illinois and longstanding critic of the standards applied by regulatory agencies to the regulation of carcinogens (see Epstein, 1978), began warning of what he viewed were the potentially carcinogenic implications that rbST carried for humans (Epstein, 1988). Epstein was the first scientist to suggest publicly that rbST could carry serious implications for human health. This concern centred upon the discovery of a noticeable increase in the trial milk of rbST treated cows of another hormone called ‘insulin-like growth factor’ (IGF-1) (Epstein, 1988). IGF-1 has long been regarded by the mainstream scientific community as one of the most powerful growth hormones occurring in nature and is found in all milk, including human breast milk. It is therefore identical across the species and in small levels is benign. Epstein argued however that as a growth promoting hormone, IGF-1 could have a mutagenic effect, inducing cell division and tumour growth if consumed at ‘sustained incremental levels’ (Epstein, 1988: 193). This led him to extrapolate that if IGF-1 could exert a biological influence on the humans consuming milk where its levels were increased, in particular promoting premature growth in children (Epstein, 1988) and breast cancer in women (Epstein, 1990).

Despite the entirely hypothetical nature of these claims, in 1990 the CVM took the unprecedented step of publishing some of the Monsanto dose response data in international journal Science. The paper, written by CVM scientists and whose publication was advertised in the Journal of the American Medical Association (JAMA) and Science News, confirmed the FDA’s agreement with the epistemic community that, while rbST-stimulated milk did contain higher levels of IGF-1, no further toxicological studies were not necessary as the levels found fell within the ‘normal’ range found in human breast milk and furthermore would be destroyed by pasteurization (Juskevich and Guyer, 1990: 875).

This effectively closed down the IGF-1 controversy for US policy makers. The CVM’s paper was succeeded by a chain of endorsements from the US scientific establishment (notably the
American Cancer Society and US National Institutes of Health). Of even greater significance was the international approval which was conferred upon rbST in June 1992 of the Joint FAO/WHO Expert Committee on Food Additives (JECFA, 1993) which paved the way for the product finally being granted a license in November 1993.

Epistemic communities that focus their efforts on trying to convince others that their interests would be satisfied by switching to the epistemic community’s way of thinking are less likely to succeed than those which focus on compromise (Adler and Haas, 1992: 383). The mismatch between the policy goals of EU policy makers and the epistemic community’s innovation however made rbST a zero sum game. After a decade of review, in October 1999, the European Commission’s newly empowered DG for Health and Consumer Protection – DG Sanco – announced its intention to propose a permanent ban on rbST. This proposal represented a significant departure from the past not simply because it bolted the already closed door on rbST but by virtue of the epistemic justification upon which it rested.

When DG Sanco assumed charge over the rbST issue the long anticipated trade dispute with the US over rbST was looming. Policy makers used their ongoing experience at the World Trade Organization (WTO) in a similar dispute with the US on hormone growth promoters to guide it in the types of evidence and standards that were scientifically justifiable in banning rbST. As a result, policy makers replaced their self-directed learning with non-formal learning commissioning scientific reports from two DG Sanco committees on the ‘adverse effects’ of rbST for animals and consumers. The first report from the Scientific Committee on Animal Health and Welfare (SCAHAW) advised that the evidence on mastitis was now sufficient to sustain prohibition (Commission, 1999a). The second scientific contribution, made by the Scientific Committee on Veterinary Measures Relating to Public Health (SCVPH), concerned IGF-1 and in particular reviewed studies that appeared to add weight to Epstein’s cancer postulate arguing that more research was required before rbST milk could be assumed to be safe for human consumption (Commission, 1999b).

We should be clear about the status of these committees and the non-formal learning exchanges in which they were engaged. While the experts were independent academic scientists, they had been vetted and appointed by policy makers whose objectives were explicit. This made the possibility of adverse selection remote (interviews). Indeed, the post-BSE empowerment of DG Sanco and accompanying explication of a precautionary interpretation on all food related risks ensured that scientists opposed to this agenda would be unlikely to be interested in participating in any case (interviews). More specifically, the Commission’s enduring interest in the scientific evidence was available concerning rbST’s risks had informed the research agendas of most of the committee members in throughout the 1990s.

2.4 POLICY PERSISTENCE

Policy persistence is underpinned by socialization processes where what has been learned is consolidated and sustained (Adler and Haas, 1992: 384-5). In both the US and EU cases,
opposing belief systems that had either resulted from or been consolidated through non-formal learning have been internalized and defended by policy makers. The longevity of these interpretations are expected to be affected by changes in the degree of consensus held by the epistemic community; where a community’s authority is diminished so too is the basis for socialization. This is not a simple matter however. Both cases illustrate that while a scientific consensus can be attacked, judgements about whether or not it has been undermined and the authority of an epistemic community / committee diminished are subjective. Throughout the rbST saga, contrary evidence was rejected by both sets of policy makers and the experts from whom they have learned.

Perhaps the greater challenge for policy makers would be how to change direction or ‘unlearn’ on rbST. This is not as far-fetched scenario as it may first appear. In the US for example, the salience of ‘pure’ and organic food movements has raised the profile of scientific studies associating IGF-1 with various human health disorders4 and resulted in a growing number of dairy processors and retailers to go ‘rbST-free’ (Fox, 2008; Pollack, 2006). Meanwhile in the EU, awareness of the significant changes in global dairy consumption and concerns that the dairy market is uncompetitive may put rbST back onto the agenda. The non-formal nature of how both sets of policy makers have learned about rbST, and their delegation to epistemic communities / committees for the epistemic means that underpins policy, would complicate any plans for policy succession or termination.

SECTION THREE: CONCLUSIONS ON COMPATIBILITY, RELEVANCE AND STRETCHABILITY

The paper makes two assertions about the epistemic communities framework. First, by positing uncertainty as a necessary condition of an epistemic community’s entry into the policy arena the variety of roles and levels of influence these actors have is not captured by the framework as it stands. Second, this variety is best explored by focussing upon one dimension associated with learning. That dimension is the control over the production of epistemic means and the ends to which those means are directed. We should be clear; the revisions suggested in this paper aim to be efficient using the reserves of unexploited explanatory potential in the framework. No overhaul of the original framework is required or proposed.

The empirical exploration offers prima facie evidence that the learning model of control over knowledge production is compatible with the epistemic communities framework. By giving the causal dynamics identified by Haas an equal billing the veil is lifted on the range of epistemic communities that enter and are consolidated in the policy arena and the variety of learning exchanges that are possible between them and policy makers. No single one of the learning types can lay an overriding claim to being the ‘natural’ descriptor of epistemic community-policy maker learning exchanges. Rather, the knowledge control model captures

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4 Two particularly high profile studies have associated IGF-1 with a higher risk of diabetes (Baur et al, 2006) and identified milk produced by rbST administered cows as one of three major contributors to increased human twinning (Steinman, 2006).
the variety of learning that exists across space and time in a single issue. The epistemic communities framework aims to address cross-national and cross-temporal cases. The contrast between the EU and US in the rbST case illustrates that the model has the advantage of increasing awareness of alternative states of learning simultaneously across space. It also helps us seen beyond the snapshot and look to the ‘moving picture’ (Pierson, 1996). Notably the EU example illustrates the dynamism of learning exchanges where institutional changes enabled policy makers to engage in non-formal learning and consolidate two new epistemic groups to rival the epistemic community and US policy makers. Such dynamism also means that we have to see beyond the current position; knowledge is rarely static. While policy persistence cannot necessarily be assumed, the political ratification of an epistemic paradigm that non-formal learning entails may construct considerable barriers to change locking policy makers in to certain ways of thinking. In this way, modelling learning exchanges through the control over epistemic means and policy ends enables us to postulate possible future scenarios.

In terms of analytical relevance, again the findings provide grounds for optimism. By distilling the four knowledge components outlined by Haas into the distinction between epistemic means and policy ends, control over different aspects of what was known about an issue can be traced empirically. Two matters of note arose that require further consideration. First, is the deracination of epistemic community evidence by policy makers in the EU. This draws attention to the fact that even where policy makers’ learning is self-directed, the knowledge an epistemic community produces may still have a role in their learning but not as the community originally intended. Second, it would be useful to consider the level of abstraction of epistemic means and policy ends. When directing their own learning, the epistemic means uncovered and developed by EU policy makers drew upon a combination of detailed pieces of information (socioeconomic impact assessments and mastitis data) and broader thematic notions (consumer perception). Greenberg and Mandell’s (1991) distinction between concrete knowledge and conceptual knowledge may be of use here.

The analysis of the CVM’s action on mastitis suggests that the model can be stretched for more fine grained analysis by applying the two-by-two matrix to each quadrant. In cases where learning exchanges are less consensual we would expect to see a wider range of variation within each category.

While it is hoped that this will ultimately form the basis for a more purposive research agenda on epistemic communities further delineation of the knowledge control model is required before this can happen. Two specific areas stand out. First, the dimensions and possible indicators associated with the four learning types need detailed exposition; the education and knowledge production literatures will be particularly important in this endeavour. Second, the scope conditions that inform the degree of control epistemic communities and policy makers enjoy over different aspects of their learning requires attention. Specifically, empirical studies are needed to explore how differences in the levels of uncertainty, types of interpretation and

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5 See Mars (1992: 38) for a discussion of this in relation to Mary Douglas’s grid group analysis.
institutional structures relate to the degree of control over knowledge enjoyed by epistemic communities.
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