

Experimenting with Accountability in Chile
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In 2011 after nearly four years of evaluation, the Chilean government approved for construction a large hydroelectric dam project. Never before had Chile's post-Pinochet democratic government faced such a long, complex and high-stakes technical decision: the dams would bring industrial development to the Patagonia, a wild region with few paved roads and a few hundred families who make a living from ranching and tourism. North and south Chileans protested the project's approval, as did the company that owns it: the government required an audit of the entire expensive and time consuming environmental impact assessment. This assessment of the assessment was supposed to be "independent" and thus boost the public's confidence in the authorities' capacity to evaluate the impacts of the project and verify that it complied with all applicable laws. Chileans in favor and against the dams agreed on one thing: stricter adherence to the rules would prove them right — for opponents, following the rules would lead the government to reject the project, while advocates argued it would lead them to approve it. A repeat of the assessment could help clarify this situation. Only the company protested the audit, along with several other requirements imposed by the authorities. In early 2014, the Chilean government asked the company to produce even more new studies hired directly by the government, not the company.

This dam project faced a crisis of accountability, which means different things to different groups. Like Chileans who supported the audit, many political scientists would look for the root cause of the crisis in unclear, unstable or unenforceable rules. From this perspective, the decision to authorize such a project should be based on clear rules and procedures, enforced by unwavering bureaucrats accountable to their superiors. The crisis is evidence of failures with compliance: superiors did not verify that bureaucrats working in the agencies that evaluated the project's environmental impacts had done their job well. Other scholars have looked for the root causes of unaccountability in a crisis of representation. They accuse that the environmental impact assessment uses data selectively, lacks transparency, and serves business interests; in short, environmentally bad projects are approved because they promise economic growth that the government desperately wants (Claude 1997; Silva 1996; Urkidi and Walter 2011).

Important as compliance and the public interest are, recent research that looks inside Latin American bureaucracies emphasizes agents' discretion in producing strong, stable and effective decisions (Pires 2013). Crucially, discretion is exercised within constraints, including those set by civil society groups, political parties, or business interests (Abers and Keck 2009). In a foundational study of these processes, Peter Selznick showed how demands made by government progressives and conservative farmers pulled the Tennessee Valley Authority in opposite directions. Despite its legal commitment to grassroots development, the TVA served conservative interests because of how it organized its work. Discretion became routinized in procedures that led to a sharing of power with conservative forces, while progressive groups were marginalized in formal but ineffective power-sharing agreements (Selznick 1949). Thus, discretion, rules and external constraints interact in complex ways to shape who is served by government agencies.

This paper adds to this literature by pointing to the importance of causal arguments in both constraining and facilitating discretion. I do this by comparing three experiments in accountability in Chile: a toxic spill that caused an environmental disaster in a protected wetland; a gold mine that threatened glaciers in the Andes; and the large hydroelectric project this article opened with. Each case was decided through the environmental impact assessment (EIA) process, a highly regulated, clear and transparent process, despite the criticisms, as discussed in detail below. Because this is a longitudinal comparison — the cases span from the mid 1990s to 2011 — I analyze processes of learning and adaptation in Conama, the agency responsible for administering EIAs. Furthermore, I examine Conama's administration of EIAs from the moment these became obligatory (1997), allowing me to ask how accountability was exercised in a new organization in a recently re-democratized country. Conama's evolution is thus also indicative of broader patterns of learning how to practice democracy in Chile. Taking inspiration from Selznick's analysis of the TVA, I do not seek to dispute scholars' complaints that the EIA promotes economic interests over political ones; rather, I examine how this work is organized. At stake are not just considerations of who wins and loses from environmental decision-making, but understandings of democracy itself. Like the TVA and its commitment to the grassroots, Conama tried to protect the environment. It failed not because of a problem of compliance and unclear rules, but because of how decisions are made. These decision-making styles are likely common across Chilean society, with consequences for how democracy is practiced in this emerging economy.

Accountability as compliance

Political scientists define accountability as how one agent can control other agents into certain types of action (Wampler 2008). This reflects a Weberian tradition extended by public choice theorists (Moe 1991; Niskanen 1971; Kettl 2000; Fligstein 2001). The ideal-typical Weberian bureaucracy was hierarchical, impersonal, technical and rule-based; external pressures like public participation threatened bureaucracies' rule-bound *esprit de corps*. While for Weber bureaucracies were forces for growth and modernity, for public choice economists these needed to be reigned in and made efficient. Efficiency required aligning incentives between principals (superiors) and their agents, where agents have better information about events than principals can thus conceal their actions and escape accountability (Cook and Wood 1989). The principal-agent model came to dominate public choice and political science scholarship on bureaucracies, and focused attention on compliance, or how principals can hold agents to account (Frederickson and Smith 2003). The principal-agent model also became politically productive. For example, Chilean President Michelle Bachelet used the model to advocate for replacing Conama with an Environment Ministry: the principal (Conama) had difficulty holding the agents (other evaluating agencies) to account, and thus needed to become a legally stronger ministry (Speech to Congress, Legislative History 20.417: page 9).

Incentives and compliance increasingly came down to rules. In this view, external pressure from society, civic organizations or even political parties threatened to force agents to deviate from following and applying the rules set by the principals. One solution was to make agents technocrats: technocratic agents base their decisions on expertise, not external pressures, and are thus efficient and effective because decisions are made quickly

and for the long-term (Fukuyama 2007). Another solution was to design “strong institutions” with tight coupling between rules and behavior, that are consistently enforced over time and thus stable. When agents expect rules to change or not be enforced, instability and lawlessness will increase as agents expect to be unaccountable — chronic problems in Latin America, according to Murillo and Levitsky (2009). Other scholars have proposed corrections to the principal-agent model by recognizing multiple principals, as in decentralized government structures, and the political nature of struggles for scarce resources (McGee and Gaventa 2011; Wampler 2008; Kubal 2008). Nonetheless these approaches retain a focus on compliance: for example, “societal accountability” is about how civil society organizations “encourage elected officials and bureaucrats to abide by the rule of law” (Wampler 2008: 76).

The problem with accountability-as-compliance is that it breeds conformity (Philp 2009; Power 1997). When agents report they have followed the rules that apply to their office, this eliminates the need for accountability: the official’s agency here has been eclipsed, and he in fact has nothing to account for. Political theorist Mark Philp illustrates this compliance trap with teachers: anyone can understand that teachers should not be accountable to the students they teach, nor even to the parents of those students. Instead, they should be accountable to society at large. But to seek this through rules creates conformity, as exemplified by the recent push to hold U.S. schools accountable for test-scores. Accountability that breeds conformity is not just counter-productive, but threatens the fabric of trust on which democracy is based because it creates incentives to report that rules have been followed no matter what. In a recent book on reason-giving, Charles Tilly called this explanation by formulas like legal codes and conventions — the wholly unsatisfying “that’s the policy!” we have all heard in the course of our research somewhere (Tilly 2006).

Discretion

Recent research on bureaucracies, rules and regulation in Latin America argues that state institutions are more accountable when they can exercise discretion, subject to constraints, where specifying what these are and how they work remains a challenge. Often, society and civil organizations constrain state actions by shaping government agencies’ agendas and providing resources state agents need to do their work (Abers and Keck 2009; Amengual 2013). Civil society organizations may provide state services directly, or critical inputs like monitoring data, leading to more effective and responsive state agencies. This mobilization of the state is thus a win-win for citizens and bureaucrats, though it is erratic and demanding work. In Brazil for example, alongside successful experiences where civic groups shaped services related to AIDS, rural schools and water, there have also been frustrations — as with push-back against rural schools and ineffective water management in Sao Paulo (Abers and Keck 2009; Tarlau 2013; Rich 2013). Scientists too can sometimes constrain government services and decisions through data-based arguments that narrow the range of legitimate government actions (McCormick 2006; Liftin 1994)(add NPPS). For example, scientists can put a check on government by defining the policy problem, as with climate change or ozone depletion (Keller 2009; Liftin 1994), or re-defining the debate by highlighting specific winners and losers, as with genetically modified organisms (Kinchy 2010).

Another important constraining device is internal to the organization. In recent work on Brazil's Labor Inspectorate, Robert Pires argues its effectiveness lies in its capacity to exercise "creative accountability", or the ability to be both adaptable and consistent (Pires 2013). Pires draws on a tradition in organization studies to emphasize how the Inspectorate's internal culture keeps agents' actions consistent within a range of legitimate options. Specifically, two alternative framings of the Inspectorate's mission are in creative tension with each other: to collect public revenues through fines (e.g., enforce the rules), and to promote social justice. Agents "sustain an internal debate about practices, customarily questioning each other, and justifying their decisions about courses of action in terms of the constitutive narratives of the organization." (Pires 2013: 634). This structured internal debate helps keep the Inspectorate accountable to the rules and broader social goals, in ways that recall the myths and logics of appropriateness identified by new institutionalists as vital to bureaucracies' effectiveness (March and Olsen 1989; Scott 2008; March and Olsen 1994; DiMaggio and Powell 1983).¹ Likewise, and contrary to the notion of "strong institutions" (Murillo and Levitsky 2009), sociologists have long found that loosely coupled organizations capable of interpreting and responding to the external environment can be more effective and stable than tightly coupled organizations (Weick 1976; Orton and Weick 1990). Even the principal-agent model has been applied to highlight responsiveness: in a study of how the U.S. Environmental Protection Agency coped when the Reagan administration slashed its budget, scholars studied not compliance to the rules but how the agency responded to different constituents, including the executive, legislative, and civil organizations (Wood 1988; Cook and Wood 1989).

Yet another constraining device is scientific arguments, or what Charles Tilly called cause-effect narratives which come as both technical reports and stories (Tilly 2006). Scholars of science and democracy have described how government agents use scientific and technical expertise to instrumentally pursue certain policy or political goals (Ezrahi 1990; Pielke 2007; Jasanoff 1990). Instrumental knowledge is particularly important to accountability: it makes the government's rationale for choosing policy A over B visible to citizens. Scientific knowledge, in the form of data, information and causal arguments, creates an opportunity for collective viewing where government agents justify their decisions and citizens attest (Ezrahi 1990; Jasanoff 2005). In a treatise comparing advanced, liberal democracies, Yaron Ezrahi makes two related observations: first, this use of instrumental knowledge is characteristic of liberal democracies, not of monarchies or authoritarian regimes. Second, instrumental knowledge can play this role because liberal democracies have a public sphere populated by witnessing citizens. Thus liberal notions of accountability and transparency are inextricably linked to the social value of instrumental knowledge. How societies and their governments produce, use and value this knowledge varies, and it varies according to political regime.

This is not to suggest that scientific knowledge causes government action, only that it constrains it in ways that are conducive to accountable and effective institutions. A brief example from the global regulation of ozone-depleting substances helps to illustrate. In the 1970s scientists first sounded an alarm that substances in common appliances were

¹ The distinction between discretion and compliance parallels distinctions between open and closed, and resource-dependent and hierarchical organizations, that have long characterized debates in organization theory.

thinning a layer of the Earth's protective atmosphere. The U.S. Environmental Protection Agency mobilized early, banning the substances (CFCs) and advocating for global action. Ten years later the Montreal Protocol regulating CFCs was signed, after overcoming opposition from the UK and France and scientific uncertainties. For example, scientists did not know precisely which substances caused the problem nor its extent. In this context, the United Nations organized a global scientific panel to collect and validate scientific results. The ozone hole was discovered after the Montreal Protocol was signed. The combination of early scientific warnings, increasingly negative scientific evidence, constant public pressure, U.S. leadership, and development of CFC substitutes helped produce a highly successful global environmental treaty (Liftin 1994).

Since then, a global scientific effort has monitored the ozone hole's evolution.² These reports produce transparency: they make the rationale for maintaining and strengthening the Montreal Protocol visible to the world's citizens. Without a cause-effect relationship between CFCs and ozone depletion there would be little to make transparent nor any reason to hold governments accountable. This example helps illustrate another important trend: many public problems, including global environmental harms, have become "scientized", meaning many believe that decision-making must reflect tight cause-effect explanations (Sarewitz 2004; Kinchy 2010; Jasanoff 2005). For example, states have built global scientific network to study climate change, but efforts to build institutions capable of translating knowledge from the laboratories to the public sphere have lagged (Edwards 2010; Jasanoff 2010). The question remains: how politically valuable is instrumental knowledge outside advanced, liberal democracies? Some who have studied foreign scientific organizations with operations in developing countries suggest these governments use knowledge instrumentally (Kinchy 2010; Miller 1998). But those who have focused on how developing country governments make decisions point to a more complex relationship. For example, in India science promotes nationalist goals (Prakash 1999; Joshi 2013), in Mexico it helps produce strategic bureaucratic ignorance (Matthews 2011), and in Ghana it is blind to local conditions (Appiah-Opoku 2001). Often science in developing countries has low credibility because it depends on corporate funding or is too close to foreign interests (Hayden 2003; Lahsen 2004).

Science and Discretion in Chile

Meaningful accountability and transparency require compliance with the rules and discretion, otherwise they risk being nothing more than a rote report that rules have been followed (Philp 2009; Power 1997). Such accountability-as-compliance eliminates actors' agency because action becomes a self-evident truth. In Chile this kind of accountability dominates: bureaucrats stress that they can only do what the law explicitly allows them to do, whereas business agents can do anything not expressly prohibited. As the next section shows, Chilean bureaucrats justify their actions with conventions and legal codes — what Tilly (2006) called formulas —, more than with cause-effect explanations. I illustrate this through a comparison of three projects evaluated with Environmental Impact Assessments (EIA). The next section describes EIAs and clarifies its relationship to accountability,

² See <http://earthobservatory.nasa.gov/Features/WorldWithoutOzone/page2.php> and <http://ozonewatch.gsfc.nasa.gov>

transparency, decision-making and rules. This is followed by an analysis of each project, in chronological order.

These three EIA projects were selected because they re-shaped environmental politics and institutions. Of the 855 EIAs reviewed between 1992 and 2010, these three met strong public protest. According to respondents and public Congressional records, the first two projects informed the government's reform of Conama and EIAs. The third project is the largest ever evaluated by the system and thus illustrates the limits of Chile's evaluation process. In addition, the cases span different industries, regions and scientific communities, so regular patterns can not be explained away as the result of one unethical business or rogue government agency. Material comes from EIA reports, court transcripts, newspapers, and dozens of in-depth interviews I conducted in 2010-2011 with the businesses, scientific communities and government agencies involved in each case. This includes interviews with at least two relevant employees of each business at the time of the conflict and with ten government employees directly involved in EIA evaluations or their aftermath.

Together the three cases demonstrate that compliance with the EIA was exercised in radically different ways: the first case led to a legal court case; the second to a private negotiation; and the last to a technocratic solution — an audit. Accountability thus undergoes trial-and-error, where the rules often provided bureaucrats little guidance on how to act. Though the authorities introduced environmental improvements to each project, these sometimes back-fired or went unrecognized by the public. I argue these efforts went unrecognized because, in their overwhelming concern to follow the rules, bureaucrats did not exercise discretion effectively. Their public reason-giving appeared haphazard and weakly based on cause-effect arguments. Scientific arguments thus both constrain and facilitate government actions: without cause-effect explanations government agents can not persuasively respond to public demands. While exercising effective accountability — with a dose of compliance and discretion — may be a matter of course where democracy has not been interrupted by dictatorship, in emerging democracies it is an art learned through trial-and-error.

My argument does not intend to suggest that rules do not matter. They matter greatly, as the next sections will illustrate. But they are not all that matter and, when it comes to environmental outcomes, rules of content matter as much or more than rules of procedure. Though this is not the main focus of this article, Chile's EIA often falls short of expectations not because EIA rules have not been followed but because the underlying environmental quality standards are weak and fail to legally empower government agents to hold companies to higher performance standards (OECD 2005).

Environmental Impact Assessments in Chile

Between 1993 and 2010 EIAs grew to become Chile's number one environmental policy tool. In Chile and other countries, EIAs anticipate a project's environmental impacts and identify ways to mitigate, compensate or eliminate these, before the project is approved for construction. In Chile projects that will have one of six legally-defined impacts are required to undergo an EIA — this includes any large industrial project that pollutes, uses resources like water, or affects a community. Consultants hired by the firm proposing the project prepare the EIA, then submit it for evaluation to the environmental authorities, aided by up to thirty-six government agencies with competence over forests, water ways,

harbors, roads, and others. Most projects are approved with new requirements, and about 5% are rejected (Barandiaran 2013).

EIAs are thus an evaluation process as well a government agency responsible for managing and deciding the outcome. Until 2010, Conama was in charge of EIAs before being replaced by an autonomous EIA Agency. The cases I examine here were evaluated by Conama except for the last few months of the third project (HidroAysén) — thus I speak of “Conama” to refer to both Conama and the EIA Agency. As a process, agency and outcome, EIAs should be accountable to the public and users. At the outset, concerns about bureaucratic inefficiency led policymakers to privilege accountability to users, that is to firms: the EIA operates as an administrative “single window”. In one process a firm obtains all construction and operating permits. A project thus can not receive green light from one agency but be held up by another. A World Bank policy, the “single window” has been promoted around the world to improve delivery of public services by simplifying requirements and taking things online.³ In this way the single window conflates accountability, transparency and institutional effectiveness.

Metaphorically, Chile’s EIA is also a single window for the government and communities to influence a project. Through the EIA, government agencies can require firms to adopt greener technologies or operations, and communities can raise concerns during the required public participation window that must be answered by Conama. However, many of the most important design decisions that produce environmental impacts are made prior to preparing the EIA and the government has no legal authority to force deeper environmental improvements.⁴ For example, the government can not require use of best-available-technologies nor change the project’s location.

Bureaucrats and scientists recognize a learning curve with respect to EIAs. According to a leading environmental scientist, the first project discussed below marked a watershed in part because it taught firms that EIAs were the only way to protect themselves from accusations of environmental wrong-doing.⁵ As the third project discussed below came around, the firm invested in a scientific EIA from the start, scientists were strategic about working with the company or government, and bureaucrats had learned to limit their responsibility for EIA decisions by appealing to the rules. The day HidroAysén was approved, the Minister for Mining and Energy sought to quiet public protests arguing that “Every project that meets all applicable laws is good for Chile.”⁶ In the Minister’s world where rules define the public good, politics and accountability are superfluous. The director of the regional EIA Agency responsible for approving the project added:

We do our work remaining attached to what the law dictates. We are governed by public law that tells us that we can only do what the law allows us, not what we are forbidden from doing, as is the case with the private sector. Everything we do occurs within this regulated framework, that is why

³ “Single Window Government: Does it Improve Delivery of Public Services and Investment Climate?”, an event held on January 26, 2005, organized by the World Bank. Video available on the World Bank’s eDevelopment website.

⁴ Letter by Claudio Meier, circulated by email. Available on request from the author.

⁵ Interviews with scientist and business agent by the author, July 4, 2011 and April 11, 2011.

⁶ Article in *La Tercera*, May 11, 2011.

rather than voting with our conscience we must vote following the letter of the law.⁷

A month earlier another high-ranking EIA employee responsible for HidroAysén expressed a similar sentiment to me:

We do not do anything outside the EIA's rules and regulations or the law. We want to narrow things down, so nothing is subjective in any sense. We want to narrow the gaps. Instructions, guides, admission tests, we want these to be more regulated and based on conventions.⁸

However, large segments of the public remain unconvinced that rules guide the EIA Agency's behavior and make two somewhat contradictory demands. The first is for EIA decisions to adhere to rules even more strictly, and the second for a legally binding public participation process.⁹ Both reflect radicalized versions of the principal-agent model. On the one hand, demands for greater compliance with rules have led to an increasingly transparent and information-intensive EIA. Over time, EIAs became longer, more detailed and entirely online, but protest and distrust with the system has also grown. On the other hand, demands for legally binding public participation reflect frustration with EIA decisions that do not respect environmentalist commitments. Environmentalists have reasons to feel frustrated. In the absence of land-use laws and strong environmental standards, public participation has little scope to influence a project, fanning fears that evaluations are done in bad faith because projects are rarely rejected. Bound by the rules, Conama often dismisses public observations with legal-speak, as in this example from HidroAysén's EIA:

This Commission takes these observations to not be open to consideration because they refer to elements alien to the environmental evaluation of this EIA, in conformity with the General Environmental Law.¹⁰

Nonetheless, legally binding public participation is at odds with greater compliance to the rules: progress towards both is impossible unless the participating public is perfectly bound to the rules, a situation that eliminates the need for public participation. The result is conformity to the rules, as anticipated by Mark Philp. Philp rejects universalist notions of accountability like the principal-agent model in favor of contingent forms where some third party can require an actor "to inform and explain/justify his or her conduct [to another actor]" (Philp 2009: 32). Thus the linchpin to institutional effectiveness lies in explanations.

By implication, in Chile stricter compliance to EIA rules would likely increase public frustration, and the government would not have the legal tools to respond to demands made through a legally binding public participation process. These contradictory demands for greater accountability in EIA decisions thus seem unlikely to improve institutional

⁷ Article in *Diario de Aysén*, Abril 28, 2011

⁸ Interview by the author, March 15, 2011.

⁹ <http://www.latercera.com/noticia/opinion/ideas-y-debates/2010/09/895-293060-9-politizacion-e-institucionalidad-ambiental.shtml>; and <http://www.elmostrador.cl/opinion/2011/05/31/hidroAysén-la-responsabilidad-historica-de-bachelet-y-la-Concertación/>.

¹⁰ HidroAysén's Environmental Permit (2011): 677.

effectiveness or environmental outcomes. Instead, this article argues a first step towards better EIA decisions is an EIA Agency capable of exercising discretion within certain constraints, where cause-effect explanations are an important constraint. For example, will decisions be based on conventions and the letter of the law, as those responsible for approving HidroAysén argued, or on rich rationales that articulate scientific, social and political concerns in a persuasive and meaningful way? I next explore this question through three EIA conflicts.

Celco Valdivia: accountability on trial

During the austral summer of 2004-2005, swans began to fall out of the sky onto roads and patios in the town of Valdivia, in southern Chile, on the banks of the Cruces river. The Cruces river wetland is a protected site home to many bird, fish and plant species, including the black-neck swan. A few months before the swan population collapsed from several thousand to a few hundred, a paper and pulp mill opened just upstream. How to prove the mill's responsibility led to an eight-year court battle that pitted the government against the company, Celco Arauco, each advised by adversarial teams of scientists, consultants and activists. In July 2013 the Judge found Celco Arauco guilty, and the company did not appeal the decision. Though environmentalists' arguments were vindicated by this judicial result, during the 2004-2005 crisis Conama appeared haphazard and erratic (Sepulveda and Villarroel 2012). At the heart of Conama's troubles lay disagreements about what the EIA permit required and why, and what counts as proof to justify decisions like whether to close the paper and pulp mill. In short, Conama staff had little handle on cause-effect explanations important to managing the mill and received little guidance from rules on how to act.

From the start, where to dump the Valdivia mill's wastewater was a problem. Celco Arauco explored two options: dump the dirty water into the Pacific Ocean at the fishing village of Mehuín, or into the Cruces river upstream from the protected wetland. However opposition to a waste pipeline from the mill to Mehuín averted Celco's plans. Conama then approved the mill with waste disposal into the Cruces river conditional on using expensive tertiary treatment and monitoring many local species. Conama thus imposed important environmental improvements on Celco Arauco, though its hands were tied on other issues. First, Celco Arauco built the mill in 2004, six years after receiving its EIA permit (in 1998). In those years, ecological conditions likely changed but Conama had no authority to request updated studies and EIA permits do not expire. Second, Conama could only evaluate the two waste disposal alternatives Celco presented; it could not propose the mill move to a different location.

In addition to these legal constraints Conama demonstrated a weak commitment to its own decisions, which changed often. This is illustrated with two examples from the mill's EIA evaluation, dealing with toxicity and monitoring, and one from Conama's handling of events after the crisis. Despite the magnitude of the crisis that later struck, Conama went out of its way to thoroughly evaluate the mill's EIA: it requested additional information from Celco Arauco and hired a consultant specifically to assess the waste-water issue. Toxicity is the crucial link between the mill's waste effluent and the disappearance of an aquatic plant the swans ate. Chlorine, organochlorides, wood resins, chlorophenols and

other byproducts make paper and pulp mill effluent toxic.¹¹ As the Valdivia mill was being evaluated in Chile, pulp toxicity was subject to important debates and increasing regulation in the United States, Canada and Scandinavia. Recently developed elemental chlorine-free production solved some but not all toxicity problems. Some Canadian provinces and Scandinavia adopted a “zero AOX” policy, where AOX (halogenated organic compounds) is an aggregate indicator of toxicity and organochlorides. U.S. actors objected that zero AOX effluent could still be toxic, and advocated for monitoring and regulating other indicators (Halliburton and Maddison 2004).

In contrast to these debates, the Valdivia mill’s EIA permit denies toxicity. The permit states that “the effluent is not toxic”, oceans also emit organochlorides, and reports on one river made of “100% toxic effluent” that still had fish.¹² Conama argues:

After more than 50 years of effluent discharge from almost 1,000 paper and pulp mills in the world, into the rivers of Canada, the U.S., and Scandinavia, important accumulations of organochlorides generated by the pulp industry have not been found in the ecosystem.¹³

Conama adopts AOX to indicate toxicity, although Chile had no legal standards for AOX and, worse, no laboratories that could reliably measure AOX. The permit states that effluent samples would be sent to unspecified laboratories abroad to detect AOX, precluding any fast detection of toxicity.¹⁴

Conama’s decision was at least in part based on the advice of a consultant hired to bring added expertise to the agency. In the EIA permit, he is identified by name only — Jacobo Homsí, employed by an unknown consulting group, KRYSTAL — and no information about his training or experience is provided.¹⁵ Homsí recommended requiring tertiary waste treatment though it is not commonly used in pulp mills around the world.¹⁶ Tertiary waste treatment removes nitrogen and phosphorus from the effluent but adds aluminum sulphate.¹⁷ In studies done after the swans died, local scientists argued aluminum sulphate was the most likely chemical culprit in the chain of events that killed the aquatic plant. However, in 1998 Conama approved the mill with tertiary treatment without evaluating the environmental impacts it could have, nor even acknowledging toxicity risks. In short, though Conama tried to raise environmental standards with additional waste treatment, its rationale was to deny toxicity rather than confront its risks.

Monitoring provides another example of Conama’s weak commitment to its own evaluation process. During the EIA’s evaluation and later during the court trial, many inside and outside Conama raised concerns that toxicity indicators like AOX were not reliable without bioassays on local species. Bioassays test how a given species responds to toxic effluent in a laboratory; they thus produce cause-effect information useful in proving

¹¹ Several of these are “persistent organic pollutants”, part of the “dirty dozen” regulated by the Montreal Protocol.

¹² Valdivia Mill Environmental Permit No. 279, October 1998: pages 13, 21, 24, and 47.

¹³ Valdivia Mill Environmental Permit No. 279, October 1998: 18.

¹⁴ Valdivia Mill Environmental Permit No. 279, October 1998: pages 17, 28 and 71.

¹⁵ Valdivia Mill Environmental Permit No. 279, October 1998: pages 14, 20. I was unable to locate Homsí.

¹⁶ World Wildlife Fund, “Informe the Observaciones y Recomendaciones”, Valdivia, November 2005: 17; and Ramsar Commission Report, April 2005: 27.

¹⁷ Valdivia Mill Environmental Permit No. 279, October 1998: 12.

toxicity. In the EIA permit, Conama required Celco Arauco to monitor a relatively long list of elements: water quality, benthic species, plants and the disappeared aquatic plant. But Conama stopped short of requiring bioassays and, one year after issuing the mill's EIA permit, acquiesced to Celco's request to shorten the monitoring list. Although the aquatic plant swans ate was the most abundant element in the wetland, it was removed from the monitoring list. Again Conama tried to raise environmental standards but stopped short of requiring tests widely recognized as necessary to understand toxicity and then peeled back its requirements.

Shortly after the mill began to operate, twice it was closed by the authorities for different violations, and then re-opened. As swans began to disappear by the hundreds, Conama again faced this decision: then President Ricardo Lagos asked Conama if he should shut the Valdivia mill. The EIA director had six hours to review the evidence and make a recommendation. He found little guidance in the EIA's rules or the permit, which states "...in case situations that put the wetland at risk are detected, actions will follow in accordance with point 12 of this permit," where point 12 reads: "If unforeseen environmental impacts should arise, the company must inform the regional Conama..., and execute the necessary actions to mitigate, repair or compensate these. The authorities must be informed immediately following the detection of environmental impacts."¹⁸ Whether to close the mill required that he exercise discretion; no rules could sufficiently specify such a situation.

Unconvinced by the scientific evidence, the EIA director recommended leaving the mill open. To the public, the decision appeared erratic: the mill was accused of several legal violations — including building a larger mill than authorized, an illegal waste pipe, and broken monitoring equipment¹⁹ — and faced several court cases, among them one filed by the public prosecutor based on the same scientific evidence the EIA director rejected. This is the court case that dragged on for eight years and finally found Celco Arauco guilty. In that case, Celco's legal strategy relied on promoting alternative scientific explanations of events and arguing it had adhered strictly to the rules. For example, although the mill's effluent surpassed several parameters of water quality, a chemical engineer hired as an expert to the case argued water quality standards had not been violated because the rule is broken only if all parameters are surpassed.²⁰ A prominent ecologist from a top research university had this to say about environmental harms while on the witness stand:

I am not aware of what it means to evaluate an input from an environmental perspective. As far as I understand, if the emission standard is met it is not necessary to do any environmental evaluation of any input because the regulator already decided under and above what thresholds we must worry about the environmental effects.²¹

¹⁸ Valdivia Mill Environmental Permit No. 279, October 1998: pages 28 and 71.

¹⁹ See: MA&C Consultores, October 2004, "Apoyo al Seguimiento Ambiental del Proyecto Celulosa Planta Valdivia Celulosa Arauco y Constitucion, S.A. Informe Final" Version 3, No. 2.; and Valencia, Antonio, 22 July 2009, "Celco Valdivia sufre serio revés judicial-ambiental" in La Nación.

²⁰ Zaror, Claudio, 22 March 2005, "Apoyo al Analisis de Fuentes de Emision de Gran Magnitud y su Influencia sobre los Ecosistemas de la Subcuenca del Rio Cruces": pages 23 and 27.

²¹ Legal transcript, civil damages case: Scientists, pages 2205 and 3713.

Within Conama and on trial, environmental harms were seen to be defined by legal codes and conventions rather than scientific, cause-effect explanations. The long court case never settled whether the mill broke water quality standards, reaffirming that rules can be a poor guide to government decisions. Instead, the judge's verdict relied on the lack of plausible alternative explanations coupled with the observed violations regarding the mill's size, and illegal and broken equipment — all elements minimized or denied by Conama, the EIA director, and the experts cited above.

Pascua Lama: negotiating accountability

Pascua Lama is a large gold mine high in the Andes overlooking the agricultural Huasco Valley in northern Chile. In 2004-2005, Pascua Lama's EIA faced intense opposition. Conama approved the project but required improving the project's environmental performance with extensive additional water catchment and treatment facilities to avoid acid mine drainage, thirty new water monitoring stations, and measures to protect nearby glaciers. As in the case of Celco Valdivia, Conama introduced environmental improvements into the project that reflected social demands. However, once again, these back-fired or were disregarded, and Conama lost credibility through the process. The reasons have to do with Conama's circuitous reasoning which fails to set a precautionary precedent, as some Conama staff had hoped, and the role of private actors in the final decision. Pascua Lama's EIA permit reflects less Conama's work than a negotiated agreement between two private parties: Pascua Lama's owner, Canadian company Barrick Gold, and the Huasco Valley's Irrigators' Association that represents industrial agricultural interests. Pascua Lama was made accountable to the Irrigators Association through this negotiation. The rules and regulations of the EIA thus provided a stage for the negotiation, but not the substance.

Pascua Lama has faced more than a decade of controversy. Opposition dates back to the mine's first EIA evaluation (in 2000), when Barrick proposed removing three small glaciers that fell within the mine's open-pit. Conama had little to say then about the loss of these glaciers. They represented a tiny percentage of total glacier coverage and rivers downstream would thus lose little water.²² Five years later, during the second EIA, Barrick proposed preserving these glaciers by moving and depositing them on top of a nearby glacier. Enormous opposition followed. As a local clergyman said, to pretend to preserve glaciers by moving them was "an insult to the intelligence". As a result, Conama reversed its earlier judgement: the glaciers were reclassified as part of the nation's patrimony and could not be removed. Nonetheless, Pascua Lama's troubles have only continued. In 2013 construction was halted and Barrick faced a US\$16 million fine for failing to meet water treatment requirements in its EIA permit.²³ Furthermore, Chilean courts required a review of Pascua Lama's EIA after an indigenous community filed a suit against Barrick.²⁴ While Chile's courts and regulatory authorities may gain credibility from enforcing Pascua Lama's EIA permit, Conama's judgement in granting the permit seems more suspect than ever.

²² Pascua Lama EIA report (August 2000), Chapter 6: 38.

²³ Jamasmie, Cecilia, *Chile imposes \$16 million in fines to Barrick for environmental violations at Pascua Lama* in Mining.com, May 24, 2013.

²⁴ Lopez, Erik, *Update 4 - Chilean court suspends Barrick's Pascua Lama mine project* in Reuters, July 15, 2013.

Conama's rationale was indeed suspect, as illustrated below by how the second EIA permit explains why glaciers were protected from removal but not from industrial activities.

Pascua Lama's EIA reports prepared by Barrick consultants provided very little information about the glaciers. These were described not as glaciers but as "compact ice" and documented in a handful of photographs that were difficult to compare — each was taken at different scales and resolution, and in color and black and white. The initial studies did not even ask how much water would be lost in rivers downstream. By omission the glaciers were unimportant. During the first EIA evaluation, no glaciologists were hired by Barrick or Conama to assess impacts on the glaciers. Five years later as opposition escalated, every party to the controversy — Barrick, the Irrigators Association, the regional government, activists, Conama and the Water Agency — hired glaciologists to assess these impacts. The glaciologists studied changes in the glaciers' size over time; estimated their depth and composition; and tried to estimate how much snow and dust accumulates on their surface. These and other variables determine how much water glaciers release into rivers.

These competing teams of glaciologists agreed on many things, but disagreed on what caused Pascua Lama's glaciers to shrink or what to do about it. Glaciologists had little data to work with. For example, the closest station that measures snowfall is located about 1,000 meters below where the glaciers lie, where air temperature rises above 0°Celsius. In addition, this station was fairly new and had not yet recorded data from even one El Niño year, when precipitation along the America's Pacific coast is highest. Next to nothing was known about winds in the area — except that they are very strong. Together such data gaps increase the error margins on snowfall estimates and how snow accumulates on the glaciers, for example. Glaciologists worked around these challenges by drawing on multiple sources of data — including data series owned by Barrick and not publicly available —, analyzed in several ways, so as to triangulate results.²⁵ They also uncovered photographs of the glaciers from the 1950s and generated new images with ground penetrating radar. Glaciologists representing Barrick in the EIA reclassified the glaciers as "*glaciaretas*"; these are immobile and thus more susceptible to global warming. After months of work, these competing teams of glaciologists agreed that Barrick's proposal to move glaciers to preserve them was inviable and even absurd. They further agreed that downstream water loss would be small because the glaciers in question were small. However, they disagreed over the causes of glacier loss, how these should be managed and what to do with Pascua Lama.

Advised by its glaciologists, Barrick claimed the glaciers were small due to global warming. But in an official report for the EIA, Chile's Water Agency pointed the finger at Barrick and warned of further damages to nearby glaciers from industry. In short, industry posed a more imminent threat to Chile's glaciers than global warming. While Conama studied the glaciers exhaustively and requested many new studies — on glacier melt, dust deposition, impacts of winds, impacts on rock glaciers, etc. —, the agency avoided asking Barrick to respond to the Water Agency's accusations, which had been echoed by a prestigious glaciologist that advised the regional government on Pascua Lama and by activists. The Water Agency's memo is part of the official EIA record, but neither Barrick nor the government ever answered to these accusations. At the same time that Conama

²⁵ Pascua Lama Second Addenda (Nov. 2005), Chapter 3 and Annexes.

willfully ignored industrial damages to glaciers, the agency declared glaciers part of the “national patrimony” to be preserved.²⁶ This contradiction weakened the import of Pascua Lama’s EIA permit.

Contradictions in Conama’s rationale are also found in the agency’s haphazard explanations regarding water loss, dust deposition and rock glaciers. Conama staff claimed to protect Pascua Lama’s glaciers following a “precautionary principle”: because studies were insufficient to evaluate the impacts of relocating the glaciers, these should not be moved. For Conama, estimates of downstream water loss were uncertain although all available estimates pointed to negligible impacts, as reflected in the EIA permit:

In a worst case scenario, assuming the total loss of glacial ice in the area of the mine’s open pit, and without implementing any of the proposed compensation measures, the impact on water flow is estimated at 2.5 liters per second on average each year, or 9 liters per second in the driest month of February. This measure has been validated by the Water Agency, given that this agency calculated an even lower potential impact of 2.5 liters per second in February.²⁷

In contrast, Conama allowed Barrick to study the effects of dust deposition on the glaciers later on. A near complete lack of studies on these issues was largely dismissed by Conama:

With respect to impacts from particulate matter [dust], the Water Agency’s regional office says the real effects of industrial dust on the...glaciers, the presence of ice in permafrost (and its importance as a water resource), and the management of snow moved from the industrial installations... (sic). In all these cases, the company says it will do studies and answer Conama’s questions, once the study is approved.²⁸

Finally, Conama argued basic information about the glaciers was incomplete and required Barrick to conduct more field studies, but approved the project with a very superficial understanding of rock glaciers which also contain water. This contrasts with glaciologists’ work, as significantly more effort went into documenting glaciers than rock glaciers near Pascua Lama. The net result of Conama’s reason-giving was to weaken the effect of the precautionary principle. The permit is poorly written and argued, creating confusion, uncertainty, and ultimately distrust.

While Conama did the right environmental thing by rejecting the notion that glaciers can be moved to be preserved, many feel it would have been more honest to compensate their loss. This was the spirit of the negotiation between Barrick and the Irrigators Association. A business group dominated by industrial farmers, the Association was initially reluctant to oppose the project of a fellow business partner, but acquiesced to public pressure. After months of protest, followed by a tense negotiation between the Association’s and Barrick’s lawyers, the Association dropped its opposition in exchange for

²⁶ Pascua Lama Environmental permit #024 (February 2006): 129.

²⁷ Pascua Lama Environmental Permit #024 (February 2006): 130.

²⁸ Pascua Lama Environmental Permit #024 (February 2006): 131.

stronger environmental protections, including an expanded water catchment and treatment system and monitoring equipment, and compensation: Barrick agreed to build a dam to compensate the loss of water and pay the Association US\$60 million over ten years for an environmental fund. The Association and Barrick celebrated the agreement as more efficient and effective than the EIA, but Huasco residents felt betrayed and Conama largely ignored the idea of compensating the loss of glaciers in the EIA permit.

HidroAysén: accountability assessed and re-assessed

The Baker river in Aysén, in the Chilean Patagonia, is the economic and cultural artery of a rural community of ranchers. Locals do not say “I am from the town of Cochrane” or “the town of Tortel”; they say “I am from the Baker”. Threatening this sense of place, the HidroAysén hydroelectric project plans to build two dams on the Baker and three on the Pascua river — where a handful of people live —, and a 2,000 kilometer transmission line to central Chile. In 2008 Endesa, that owns HidroAysén, submitted its EIA. Learning from Celco Valdivia and Pascua Lama, from the start Endesa invested in a good EIA: scientific teams from eight universities spent three years studying the region at a cost of US\$12 million. The resulting EIA is the longest ever, “one cubic meter” of information according to those who had to assess it (table 1). In 2011, the EIA Agency granted HidroAysén an EIA permit with many conditions, among them that the entire EIA be audited. Endesa appealed to the Committee of Ministers for Sustainability, responsible for reviewing appeals to EIA decisions. In January 2014, this committee resolved several concerns but required two additional studies from Endesa: on impacts to the Baker river’s morphology and on the social impacts as the population doubles during construction. In short, after almost a decade of EIA studies, HidroAysén’s EIA is still in the making and Endesa’s investment in science does not seem to have paid off.

Table 1. The growing size of EIA reports and processes				
	EIA length in pages	Universities hired	Observations from government	Pages in the permit
HidroAysén	Several thousand	8	Few thousand	2000
Pascua Lama	Several hundred	0	Few hundred	178
Celco Valdivia	11	1	Few dozen	73

HidroAysén’s EIA points to tensions over information versus knowledge that illustrate the limits of transparency. As the EIA evaluation was coming to a close, scientists involved in the process said HidroAysén’s EIA “pushed against the limits of the knowable” because so little was previously known about Aysén and the project was so complex.²⁹ A former Conama director told me there was no information about HidroAysén he could trust.³⁰ And in the course of over twenty interviews with scientists, government agents,

²⁹ Interview by the author, January 19, 2011.

³⁰ Interview by the author, June 2, 2011.

activists and Endesa staff, no one could name HidroAysén's five biggest impacts. Despite the resources dedicated to collecting EIA data, no one had a clear idea of what would be the project's most serious environmental impacts. Though knowledge of Aysén was relatively sparse, the environmental impacts of dams are well known and predictable.³¹ Instead, these admissions of ignorance from individuals most likely to be well informed about HidroAysén are better understood as expressions of frustration with the evaluation process and an accompanying reluctance to accept responsibility for the results — in other words, a fear of being held accountable for how the decision was made. This explains why Endesa's investment in science did not pay off, and is illustrated with an analysis of how information is organized in the EIA, how this applied to impacts to the Baker river's morphology, and how an ambitious forestation plan was assessed.

EIAs consist of two parts: baselines and impact evaluations. HidroAysén's baseline recorded Aysén's ecological conditions — this is the record against which to measure changes produced by dam construction. As in Celco Valdivia and Pascua Lama, scientists faced data gaps: only three water stations exist on the Baker, and the data they generate belongs to Endesa and is not publicly available. No equipment measures rain or snowfall over 800 meters above sea level, where most of the region's enormous glaciers lie. In addition, Endesa's consultants who wrote the final EIA were careless: the report submitted for evaluation contained maps at an illegible resolution, costing government evaluators precious time. They were also careless when evaluating impacts; for example, the 10-point scale used to rank impacts lost a whole point when applied to impacts on the river. Of hundreds of impacts HidroAysén is expected to have, one third of the most significant impacts related to losses of flora, fauna and habitat. Nearly all impacts to the Baker river were labeled as only of medium or mild importance.³² This is interesting because Endesa argued the project will benefit the region by creating new lakes and habitats; thus the most significant positive and negative impacts are supposed to cancel each other out.

The Baker river's morphology will be significantly impacted because HidroAysén plans to operate with hydro-peaking. This technique holds water in the dam's reservoir during hours of low electricity consumption and releases it during high consumption, to maximize revenues. The consultant who led studies on the impacts of hydro-peaking on the Baker for Endesa was clear: hydro-peaking will “produce summer and winter conditions every day, twice a day. This creates total confusion to animal and plant species that depend on the river”.³³ As the water level fluctuates, river banks are continuously exposed and inundated, producing erosion, habitat destruction and dangerous conditions for navigation.³⁴ Yet in the EIA report, these impacts are broken down into multiple little parts: for example, “changes to the water flow regime” will have “mild” impacts; impacts on native fish from hydro-peaking will also have “mild” impacts because there are few native fish; and interruptions to navigability on the Baker will also be only “mild”. The report does not explain why. Impacts on navigability are said to not be extensive (score 0) and only a little relevant (score 1), though every person who wants to get on the river's water will be

³¹ See reports by the World Commission on Dams (<http://www.unep.org/DAMS/WCD/>) and any textbook on energy.

³² HidroAysén EIA (2008). Impacts have mild (21-40), medium (41-60) and high (61-100) importance.

³³ Interview by the author, December 6, 2010.

³⁴ HidroAysén EIA (2008), Annex D, Appendix 4.

affected. This includes local residents — admittedly few, but strongly linked to the river — and kayakers and fishermen, who come from around the world to Aysén for this purpose.

Like all large dam projects, HidroAysén will deforest large areas that must be compensated by foresting an equivalent area. Endesa proposed to plant native trees on 11,000 acres. Such a large forestation effort with natives has never been tried. Two forest ecologists who do research full time in Aysén were skeptical. Endesa's proposal relied on pesticide-intensive forestation techniques used in warmer climates, and planned to "reforest" wetlands and steppes that had never had forests. They argued HidroAysén's promise create new thriving native forests was dishonest. Endesa staff replied with a reforestation "scientific experiment" on 30 acres by the Pascua river to demonstrate their proposal's feasibility. Following the rules, one year later the Forest Agency certified that the experience was successful: over 90% of trees in the parcel were "reforested and growing". Endesa published the results in short, two-page articles in industry magazines.³⁵ What to Endesa was an "experiment", to scientists was an "experience" and to the Forest Agency a "legal requirement" in response to work done on the Pascua.

Forest Agency staff hid behind a narrow interpretation of forestry regulations to evade the ecologists' criticisms. They explained that companies like Endesa are required to forest "similar soils" to those impacted, and the agency's role is verify one year later that 90% of more of the trees are growing. Although Forest Agency staff are usually forest engineers, they can not interpret "similar soils" — it is far too ambiguous I was told. Could they draw on the ecologists' critique to raise Endesa's standards? Agency staff replied that "no one can say right now how the reforestation plan should be done, with what methods, trees, management protocols, etc. There is no experience with this...No one can say what is best...The companies have to do 'trial and error' to produce this information... Without experience, there is no evaluation.", and proceeded to question the ecologists' credibility by speculating where their funding came from.³⁶ This answer illustrates that agency staff do not see science as a systematic method of inquiry through which to learn; on the contrary, learning occurs through "trial and error". Furthermore, the answer illustrates agency staff hiding behind rules to avoid exercising discretion. Instead of questioning what environmental impacts pesticide-intensive forestation on non-forest ecosystems will have, they asked Endesa to repeat studies of tree cover. The original EIA studies used a methodology that is not sanctioned by the EIA's rules and regulations.³⁷

HidroAysén's EIA beat many records, including that for transparency: hundreds of documents are available online, including the EIA report, every call to every meeting, requests for information, and public comments. And yet few people could outline the project's main impacts. In addition to hydro-peaking, forestation, navigability, and social impacts, a litany of additional issues constantly inundated and receded from public debate:

³⁵ Lignum (01/26/11); Buscagro (no date); and Uruguay's forestry industry magazine (02/01/11).

³⁶ Interview by the author, March 21, 2013.

³⁷ I was not able to find the "similar soils" rule. EIA regulations require a "permit to cut or use native forests" for which it must "consider" reforesting an area at least the same size as that cut down (D.S. 95, art. 102). This rule refers back to Decreto Ley No. 701 of 1974 (art. 21), reformed in 2008. I did not find the relevant article in the new law. How to issue this permit is explained in guidelines prepared by the Forest Agency. On page 53 these say the company must submit a reforestation "management plant" (D.S. No. 93 of 2008, art. 19 letter g) that includes using the same type of forest (Law 20.281, art. 2, number 26, and in D.S. No. 93) on "similar soils". However, the "similar soils" requirement is not followed up with a legal citation.

the discovery of a new native fish species; seismic risks; climate warming produced by the reservoir lakes; risks from glacial lake outbursts; sediments; and many more. As the end of the EIA process approached, public debate focused on whether a few square miles of an enormous national park could be legally inundated. When this kind of legal minutiae overwhelms discussions of far more substantive issues, like hydro-peaking and massive forestation, accountability becomes a box to be checked and the Minister's dictum — "Every project that meets all applicable laws is good for Chile" — replaces democracy.

Conclusion

This article has shown that Chilean bureaucrats evaluating the environmental impacts of large economic projects rely too much on conventions and too little on cause-effect explanations. This reflects a commitment to rules and regulations as the only guide to government action, and reinforces a narrow understanding of accountability as compliance and transparency as a check-list of rules followed. From the mid 1990s when EIAs were first required, to the 2010s when EIAs were reformed, transparency increased phenomenally: anyone with an internet connection can access every report and legal step of the EIA. Reports have become more technically sophisticated and thoroughly inspected. Yet discontent and distrust have also grown, prompting calls for stricter adherence to the rules and legally binding public participation. These calls are compatible with other scholars' findings regarding EIAs in developing countries; they argue that EIA procedures co-opt the opposition (Li 2009; Urkidi and Walter 2011) and conceal risks that are incompatible with dominant economic growth plans (Bedi 2013). In contrast to these approaches that focus on universalist ideas of accountability, democracy and economic growth, by using a longitudinal method this analysis situates EIA conflicts in Chilean practices to better understand how and why democratic decision-making was organized in these ways. The result highlights that in addition to business pressures, governments are responding to reductive definitions of accountability and thus failing to build bureaucracies capable of exercising discretion, needed to effectively respond to public demands.

Building bureaucracies capable of exercising discretion is difficult. Following rules is comparatively easy. This analysis further shows how bureaucratic discretion relies on adept use of causal arguments, which often are produced by scientists or experts. Many studies black-box experts — they are simply technocrats who derive authority from their expertise, without much inquiry into what validates this expertise nor what this means for how they work (e.g., Fukuyama 2007; Montecinos 1998). As problems like climate change become "scientized" and knowledge-intensive policies like EIAs are required by global financial institutions (Wright and Rwabizambuga 2006), the role of scientific and technical knowledge in building democratic practices becomes increasingly important and interesting, particularly where scientific communities and democracy have been interrupted by dictatorship. In countries like Chile, universities and the scientific communities they house are strong in that for a century or more they have survived enormous budget fluctuations and repression (Barandiaran 2012). But they also face a crisis of credibility, given their financial weakness and government agents' low familiarity and appreciation for scientific expertise, as illustrated in this article. This disconnect between science and government renders bureaucracies' evaluations ineffective and unpersuasive and ultimately weakens democracy.

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