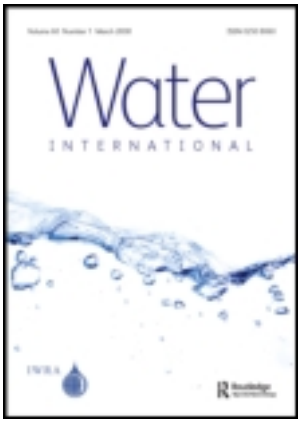

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Hydroelectric power generation in Chile: an institutional critique of the neutrality of market mechanisms

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This paper presents an institutional analysis of hydropower development in Chile, focusing on the main legal institutions involved and relevant jurisprudence. Hydropower expansion took place within a neoliberal institutional framework imposed by the military government (1973–1990) that included reforms in both the water and electricity sectors. One of the stated purposes of these reforms was to remove ideology from both water management and electricity generation and ensure the neutrality of the state. The paper argues that the security of property rights for hydropower activities is not value-neutral but sustained only through marginalizing other water rights and interests, such as in-stream uses.

Keywords: Chile; water rights; water conflicts; hydropower; neoliberal reforms

Introduction

Like other sectors of the Chilean economy, hydropower has been managed under the free-market neoliberal model imposed by the military government (1973–1990) through water reform (1981) and electricity reform (1982). One of the main arguments behind the neoliberal reforms was the need to remove the ideological content from both water management and electric generation so that markets can act naturally, neutrally, and therefore apolitically in pursuit of an efficient allocation of resources. The paradox is that this argument is itself highly ideologized, and ignores the institutional frameworks of markets.

In this context, two points emerge that require a review of the major aspects of the Chilean hydropower model. First, in spite of the rich literature on institutional economics of water (Bromley 1985, 1989, Aguilera 1999), the political, legal, and judicial contexts are often ignored by the orthodox analyses of the Chilean case (with some exceptions such as Bauer 1998a, 2004, 2009, Budds 2004). As a consequence, these views present the Chilean model as a neutral or apolitical system with respect to the allocation of water resources and the generation of electric power (e.g. Bernstein 1991, Blanlot 1992, Büchi 1993, Hearne and Easter 1995, Jadresic 1997, Vergara 1997, Briscoe *et al.* 1998, del Sol 2002, Donoso 2003).

Second, privileging hydropower over other water users flies in the face of the international mantra of "integrated water resources management." Privileging it over other

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sources of power also gives it an artificial dominance within the power grid (Bauer 1998a, 2009).

The main purpose of this paper is to present a general perspective on the Chilean institutional framework for hydropower, questioning the supposed neutrality of the orthodox perspectives on Chilean water and power reforms, and emphasizing the institutional links between the two sectors, which orthodox perspectives do not consider. The next two sections describe the broader context, first by reflecting on the role of an institutional approach on private property and its allocation. This perspective shows how the institutional contexts define the features of property rights and the efficiency of their distribution, rather than those rights having a natural definition (Bromley 1985, 1989), with their allocation determined by self-regulating markets. We then look at how the Chilean model for managing water and power generation is deeply rooted in a specific ideology about economics and distributive justice. The third section gives an overview of the Chilean water model and explains how it conceives of the appropriation of fresh water and river basins in order to facilitate their transformation into hydropower. Special attention is given to the relevant aspects of the water code of 1981 (Chile 1981) and the General Law of Electricity Services (*Ley General de Servicios Eléctricos*, LGSE) of 1982 (Chile 1982). The final section discusses three other examples of institutional preferences for hydropower: conflict resolution and the *juntas de vigilancia*; the national environmental impact assessment system; and judicial decisions and performance.

The analysis leads to the conclusion that in Chile, fresh water is not allocated naturally by apolitical markets; rather, the institutional framework determines that water should flow toward specific extractive uses and privileges hydropower generation. Consequently, the security of private property for specific water uses, and for developing specific industrial activities, exists only at the cost of other private property rights and other interests that are not recognized as having such rights.

The institutional approach to property and markets

Neoliberal justification of private property basically supposes, first, that private property allows an efficient internalization of externalities, which is difficult under a model of communal ownership because it involves large transaction costs (Demsetz 2002). Second, state planning models are inefficient because the state lacks information for the efficient allocation of resources, in contrast to a system of market prices, which gives the correct information to individuals for efficient resource allocation (von Mises 1951). The idea is that efficiency theoretically appears as an automatic effect caused by the valorization of goods through price signals. These prices, emerging from the individual decisions involved in transactions of private property within unplanned markets, provide the right economic incentive to encourage the movement of resources from lower- to higher-value uses (Coase 1960). In addition, the market is naturalized as a spontaneous order that does not require any central decision for its existence (Hayek 1966).

In light of this perspective, there emerges an orthodox approach to markets which sees them as spontaneous platforms on which goods are traded following the law of supply and demand. Through this phenomenon, the value of the goods is fixed apolitically by a price system, which provides the right information for neutral allocation. However, from an institutional perspective, this theoretical idea falls from its abstract dimension and acquires an institutional body through social arrangements that determine the role of markets and private property in efficient allocation (Bromley 1985, 1989). Those arrangements decide the specific nature of market institutions and private property.

Thus, individual decisions that fix value through prices in markets are limited by the values embedded within institutional definitions of property and the "rules of the game" that regulate its interchange. Consequently, "efficiency" will depend on those institutional arrangements, rather than on the supposedly natural rules of markets, property, or spontaneous order.

Private property can be understood as an institution for allocating scarce resources, and it involves rules for governing access and control of those resources under the supposition that resources can be divided as discrete entities and individually assigned to some particular person, who can exclude another person with respect to the object (Waldron 1988). But this general concept of private property will emerge within particular legal systems, as particular bundles of rights, liberties, powers, and duties. Therefore, those specific institutional arrangements determine the efficiency of the distribution and also who is benefited and who suffers the cost (Bromley 1985, 1989).

These ideas are extremely important to understanding the Chilean hydropower model. In this model, both water and power institutions have been seen as based on a neutral and apolitical system for the efficient distribution of water and power generation. From an institutional approach, however, we can see how the political-ideological, legal, and judicial arrangements of the water and power institutions shape particular conceptions of property rights with regard to water and river basins. These particular conceptions will allow a broader comprehension of how water and river basins are appropriated for transformation into electricity, who is benefited, and who suffers the cost.

Ideological background of the Chilean model[1]

On 11 September 1973, the Chilean military forces staged a *coup d'état* against the socialist government (1970–1973) of Salvador Allende. As a response to the egalitarian policies of Allende, the military and their civilian advisors and supporters developed a revolutionary economic project. For decades before the coup, the Chilean state was the main engine for economic development (including electricity and water) and also the regulator of social inequities. This state centralism was radicalized by Allende's government. The highly egalitarian and inclusive policies strengthened the dominant role of the state in the economy and weakened private property rights, which generated a reaction in centrist and right-wing political sectors, where it was claimed that Allende's government had ideologically influenced national institutions to the point where military intervention was necessary and justified.

The first aim of the military government was to exterminate, by a military logic, the Marxist doctrine (Brunner 1981). The new government considered that the economic and institutional situation was in crisis. That perception was based on neoliberal ideas of freedom, efficiency, and state failure: (1) the state had exerted a high discretionary power in both production and distribution; (2) this discretionary power had been influenced by interest groups, and consequently (3) the economy had been ideologically altered, (4) efficiency had been not maximized, and (5) freedom had been threatened. According to this perception, the military government developed a foundational project that led to a total renovation of political and social institutions (Vergara 1985). In brief, this process aimed to erase the egalitarian/statist model by articulating an overarching neoliberal economic model.

This model was institutionally realized through the following elements: (1) privatization of economic activities, (2) limitation of state economic regulation, (3) strengthening of private property rights, (4) openness to the international economy, (5) freedom in pricing,

and (6) free functioning of markets (Vergara 1985, Foxley 1995). All these elements were raised to the level of legal axioms in the Chilean Constitution of 1980, which explicitly limited the state's role in economics and reinforced the right to private property and the freedom to pursue economic activities. Thus, neoliberalism had been constitutionalized (Bauer 1998a, 1998b, Ferrada Bórquez 2000), and consequently sectoral reforms (e.g. in water and power) and the role of court decisions were reorganized by these revolutionary features.

The institutional framework of hydroelectric generation

Comprehensive neoliberal reform required a series of sectoral modifications in order to modify the entire previous statist economic model. In the words of Hernán Büchi (Pinochet's minister of finance, 1985–1989), "In Chile there had to be . . . a complete sweep within all the sectors of the economy to remove the statist weed. That was what gave the Chilean economic revolution so much significance, range and depth" (Büchi 1993, p. 64).

Because hydropower generation is an economic activity managed under legal frameworks for both water and power, its management experienced major changes within the new economic model. On the one hand, the new water code of 1981 would manage water as a full commodity, susceptible to being traded in the market among different users for power generation. On the other hand, this activity would be regulated by the new electric law (LGSE), to generate free competition among generators. Both sectors were reformed into a highly private, market-based system to ensure political freedom and maximize efficiency in water allocation and electricity production.

The water code of 1981

The new water code of 1981 created a model based on a radical expression of the neoliberal idea for managing natural resources. Because of its highly dogmatic approach, the new code is considered a "textbook example" of a market-based system for managing water (Bauer 2004). The simplistic description of this model led many economists and water experts from the World Bank and the Inter-American Development Bank to present it as a successful model for international water reforms (Bauer 2004); it was also presented as a successful case of "free market environmentalism" (Anderson 1991, Anderson and Leal 2001).

To guarantee the idea of political freedom, the underlying concept was based on the need for an efficient allocation of water resources that would be ideologically neutral and not controlled by the state. The main argument behind the promotion of this model was the assumption that under a free-market system, the resource would be used efficiently as long as its market value promoted investment, productivity, and a flow toward its highest-value use.

To put this logic into action, a system was installed which created private property rights and the exclusive right to use water, with explicit constitutional protection. In addition, these rights can be freely traded separately from land, which constitutes water as a fully marketable commodity. In this context, the Water Directorate (Dirección General de Aguas, DGA) plays the reduced role of granting the original allocation of water rights whenever there is enough water available in the basin and other minimal requirements demanded by law are fulfilled. The agency does not have authority to plan or to resolve conflicts.

Two kinds of water rights

In an ideal free-market water system, there could be no state planning. Instead, water would be allocated according to its highest value, through individual decisions adopted within self-regulating markets. This is exactly what the Water code tries to do, without imposing special legal rules to determine preferences among different water uses (Bauer 1998a). However, the water code does make a crucial distinction between two kinds of water rights, an institutional definition that determines the destiny of water markets and water allocation: consumptive water rights and non-consumptive water rights. While the former authorizes the extraction of water for activities that imply its consumption (e.g. mining, irrigation, and urban uses), the latter allows water's use with the obligation to return it to the stream. This is a way to encourage multiple uses of water (Bauer 1998a, 2004, Dourojeanni and Jouravlev 1999).

Although the water code does not make explicit the use of non-consumptive water rights for hydroelectricity (Bauer 1998a), it can be concluded that the objective of creating non-consumptive water rights was to encourage hydropower without violating the existing downstream consumptive water rights. This idea is confirmed by statistics that show that nearly all non-consumptive water rights are used for the generation of electricity (Peña 1994, DGA 1999, Matus 1999, Orrego 2002, National Congress of Chile 2005).

The creation of non-consumptive water rights constitutes an institutional preference for hydroelectricity. This hypothesis is strengthened by the way that other possible uses for non-consumptive water rights that correspond to in-stream uses (e.g. conservation, navigation, recreation, cultural uses) are discriminated against by explicit legal recognition, as objects of property rights. This idea is confirmed by two institutional arrangements. First, the water code only recognizes, as objects of the original acquisition of water rights, those water uses that involve the extraction or capture of water at some point in the stream. That is because, in order to apply for the free original acquisition of water rights, it is necessary to specify the water's point of extraction or capture in the basin, and, in the case of non-consumptive water rights, the point of return or release of water as well. In addition, because of the modifications made to the water code in 2005, taxes have been applied to those non-consumptive water rights which have not been used.

Second, within the administrative realm, the DGA has refused to grant applications for non-consumptive water rights for non-extractive water uses. The agency argued that because there is no extraction, it is not necessary to obtain water rights.[2] Based on this administrative practice, non-extractive uses have been marginalized as objects of water rights.

Water flows for in-stream uses do not require extraction or capture, unlike consumptive uses and hydropower. As a result, in both the legislative and administrative contexts, in-stream uses are marginalized as objects of the original acquisition of water rights. The only alternative way to obtain those rights is by paying for them in the market, but with an extra cost since it will be necessary to pay a tax for non-use.

In addition, the difference between consumptive water rights and non-consumptive water rights also determines the water market's behaviour regarding extractive uses and, consequently, what is understood as efficient allocation. Because of the establishment of a legal difference between consumptive and non-consumptive water rights, two distinct markets emerged. At first look, there is supposedly no problem in creating two separate water markets since the non-consumptive water rights presuppose the obligation to return the water to the stream, and therefore do not impose externalities on other water rights holders downstream. But that assumes that the water is released immediately after it is captured, without affecting the flow's timing.

In practice, however, hydropower companies have used their non-consumptive water rights to control water flows according to the power demand within the national electricity grid (Bauer 1998a, 2004, 2009). This action causes externalities downstream, and many conflicts have arisen between the hydropower sector and other users, especially irrigators. Although the water code does not mention any explicit authorization for hydropower companies to control flows using their non-consumptive water rights, this practice has been recognized as a right by court decisions (since the Supreme Court decided the *Pangue* case in 1993).[3]

The right to store and control water, and the fact that non-consumptive water rights are traded within a separate market from consumptive water rights, means that it is difficult for the externalities related to the storage and control of water to be the object of market negotiation among different sectors (e.g. hydropower and irrigation). As long as non-consumptive water rights suppose the legal obligation to return the water to the stream, and irrigation activities demand the consumption of the water, irrigators will not be able to use the water rights they buy for irrigation activities to absorb hydropower externalities through market transactions. On the other hand, it is easily possible for a hydropower company to buy consumptive water rights in order to use them in power generation. While the free market was designed to absorb externalities neutrally, the institutional constraints make it very difficult for consumptive water users to solve their conflicts with hydropower in the market. Although consumptive water users can bargain for the acquisition of non-consumptive water rights in order to protect their consumptive water rights, they would not be able to use those non-consumptive rights in irrigation practices. Moreover, since the water reforms of 2005 (discussed below), they are forced to pay a tax for the non-use of the rights. On the other hand, if hydropower companies buy consumptive water rights in the market, they actually can use them in power generation. In sum, the incentives to bargain over externalities in the market are institutionally regulated in favour of hydropower uses.

These institutional arrangements show that the creation of non-consumptive water rights and the separation of the two water rights markets do not grant the complete freedom that the supposedly neutral law of supply and demand would have in assigning water resources. On the contrary, these arrangements reveal an institutional decision that is politically oriented toward encouraging the development of hydroelectric energy. This situation shields the water-use rights for hydroelectric purposes from their reallocation to other uses.

Original allocation and cost-free status of rights

The original allocation of new water rights is determined by the DGA as long as there is enough unclaimed water available. If there is not enough water, the interested user has to go to the water market. Originally, the water code did not require the applicant for new water rights to justify the use of the volumes of water requested, nor to make effective use of the water (beneficial use doctrine), nor to construct the infrastructure for extraction, nor to make any payment for the rights' acquisition or use. This determined the original cost-free status of water rights and the perpetuation of this status over time. These particularities have meant that the great majority of non-consumptive water rights are now owned by the main electricity companies, without payment for the acquisition of those rights.

This phenomenon created a high concentration of non-consumptive water rights that have produced monopolies, the non-use of a significant percentage of the rights, and barriers for new competitors. In effect, the principal power company in the country (ENDESA) controls 55% of all the non-consumptive water rights granted in Chile and 10% of the rights pending allocation. Within Region XI alone (the region with the highest hydropower

potential), ENDESA owns 98% of the current rights and 16% of the pending rights.[4] This situation implies a monopolistic control over the non-consumptive water rights, with the possibility of unilaterally controlling the installation of new projects and hence the electricity supply and therefore the price of electricity. For example, ENDESA generates about 68% (4688.8 MW) of the total potential for hydroelectricity installed in the Sistema Interconectado Central (SIC), followed by Colbún with 17.9%, and then by other companies (Figure 1).

Water code reform in 2005

In 1992, as a result of this situation, reforms to the water code were proposed, to discourage both applications for new rights for speculative ends and the non-use of existing water rights. After 13 years of discussion, the reforms were approved in 2005 (National Congress of Chile).[5] Law 20.017 establishes a progressive and annual tax for the non-use of water rights, the objective of which is to promote hydroelectric generation by removing the barriers to entry for new companies. This is because the tax would induce the owners of water rights to make a cost-benefit analysis among three alternatives: paying the tax, using the rights, or putting them on the market for others to acquire and use. The tax demonstrates an institutional decision to intensify the usage of water, emphasizing its condition as a factor of production with special relevance for the generation of electricity and denying its other in-stream roles.

The reform is biased against those non-extractive water uses, insofar as it taxes them for not being "used" and consequently discourages their existence. For example, anyone who bought non-consumptive water rights for environmental conservation, cultural uses, or recreational purposes would have to pay the corresponding tax because they lack the facilities to extract or capture water. A hydroelectric company, in contrast, would not have to pay those taxes if it were using the water through the required facilities. Consequently, if an electricity company renounces or sells its unused rights to avoid paying the tax, these rights could not be easily redistributed for non-extractive uses of water. In the case of

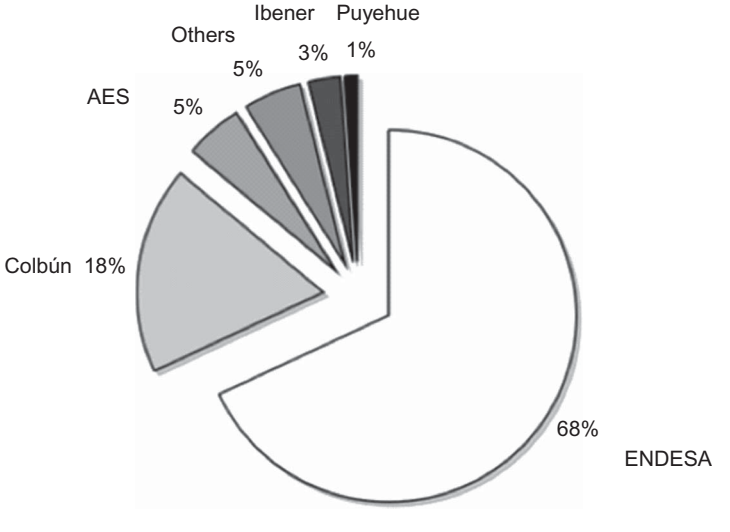

Figure 1. Percent of generating companies' participation, out of the total hydroelectric power generated in the SIC. Elaborated by the authors based on CDEC-SIC (2006).

renunciation, the non-extractive user cannot apply for the original acquisition, and in the case of selling the rights, the buyer would be bound to pay the tax for non-use.

It is important to point out that a temporary provision of the reform exempts owners from having to pay the taxes for non-use of non-consumptive water rights in areas of high hydroelectric interest until the year 2012. This deferment "represents the transaction formula that allowed for the acceptance of the reform by those sectors that considered themselves harmed by it" (Segura 2006, p.210).[6]

Almost none of the non-consumptive water rights that are in use for electric generation were acquired within markets; instead, they were acquired either from the DGA through the system of original acquisition, or through the process of privatization of the state companies, which involved the privatization of the water rights that belonged to those companies. Once the non-consumptive water rights are acquired, the rights holders pay nothing for their use. This fact implies a decrease in the average costs of hydroelectric generation, making it more competitive in comparison to other available technologies. This is not due to conditions fixed by a free market, but rather because the water code prescribes the cost-free status of the resource.

Table 1 shows that water is a free resource, unlike the competing energy sources (i.e. liquid natural gas, diesel fuel, coal), all of which have costs for fuel. This determines the lower average cost of generating hydroelectricity. Since the electric law requires power plants to feed their energy into the grid according to their economic performance (as discussed in the next section), the low cost of hydropower, thanks to water's cost-free status, privileges it above other sources.

The Chilean electricity sector model

In order to harmonize the power sector with the new economic ideology, the military government radically overhauled the previous statist model and "created one of the world's first competitive markets in electricity" (del Sol 2002, p. 438).

Table 1. Generation cost by type of energy source and power station. Hydropower has no costs associated with water as a factor of production.

Type of energy Power station	Investment per unit	Fuel cost	Operation cost (US$/MWh)	Average total cost (US$/MWh)
Hydroelectric	(US$/MW)			
Dam (400 MW)	1000	none	none	17
Run-of-the-river (400 MW)	1300	none	none	24
Thermoelectric	(US$/Mbtu)			
Natural gas (370 MW)	630	4.23	33.1	46.3
LNG (370 MW)	630	6.50	43.9	53.0
Natural gas/diesel, 500 hours (370 MW)	670	5.78	45.3	62.4
	(US$/ton)			
Coal (250 MW)	1000	80	33.1	49.3
Coal/petcoke (250 MW)	1250	60	22.6	42.8
Coal/fluid petcoke (250 MW)	1600	80	28.9	54.8
Diesel (120 MW)	450	600	192	212

Source: Table adapted from CNE (2006).

As in the case of water, through the new electric law of 1982, the military made changes in the power sector to create a system that is led by market forces and favours private investment and free competition. According to its proponents, the new model was designed to eliminate subjective political judgments and to favour the application of wholly neutral and objective criteria (Wisecarver 1986), thus guaranteeing maximization of profits and autonomy for economic agents (Espejo 2005). Prior to this new institutional framework for electricity, privatization was initiated in 1978 through the reorganization and restructuring of state-owned companies, which were then fully transferred to the private sector in the mid-to-late 1980s, including their water rights (Blanlot 1992, del Sol 2002).

In this new scenario, the generation of electricity was totally opened to competition and consequently could be freely driven by private initiative. Thus, power generation was no longer considered a public service, so the power companies were not obligated to obtain concessions from the government (Evans 2003, Vergara 1995, 2004). This freedom was also sustained by the fact that state planning of new electricity projects is non-binding and is based on projects presented by private companies, which are not obligated to carry them out in fact.

The idea of private freedom to generate power is strengthened by the fact that the infrastructure for electricity is not considered a use of land that is susceptible to regulation by different land-use planning instruments (Fernandez 2004). The owners of the electricity infrastructure are currently not obligated by these instruments when it comes to deciding on the location, construction conditions, maintenance, or operation of their infrastructure.

Considering that under the new model the main goal was to diminish the level of state influence in order to reach economic efficiency, one of the key elements of the new legal framework was the introduction of free competition within the generation sector, which meant that there should be no institutional preferences for particular power sources. To develop such competition, the electric law created regulations that would allow the existence of a market for electric power.

According to the electric law, generation companies are allowed to trade their energy at free market prices to buyers with a connected capacity of over 2 MW (i.e. large industries and mining companies). On the other hand, for small consumers, the electric law created a regulated price system which sets prices as close as possible to marginal costs, ensuring competitive prices (del Sol 2002, Evans 2003, Vergara 2004, Bauer 2009).

Considering the prohibitive cost of large-scale storage of electricity, the electric law created a sophisticated system to match power supply with power demand. The heart of this system is a quasi-private organization known as the Economic Load Dispatch Center (*Centro de Despacho Económico de Carga,* CDEC). The CDEC coordinates power generation with power demand, deciding which power plants must enter into operation in order to instantaneously match the demand at that precise moment. The criterion used for that purpose is based on an order of merit associated with the operating cost of each power plant, completely independent of the commercial contracts that each power company has. This means that the first generator whose electricity is loaded into the grid will be the one that has the lowest operating cost at that moment. Afterwards, the power generated by the other power plants will be loaded in a successive manner until the total electricity loaded allows satisfaction of the demand. The companies also transfer energy among themselves on the spot market to fulfil their contracts with third parties. These transfers are determined by the CDEC and are valued hourly at the marginal cost (spot market price). According to this idea, the competition will lead to lower power prices, since the different companies compete to feed their megawatts into the power grid.

This model was designed to eliminate subjective political judgments that can create preferences for specific power plants, companies, or technologies and thus artificially alter the market equilibrium in a sector which is difficult to manage under a competitive framework. However, in spite of orthodox analyses that consider this model to be technologically neutral, from an institutional point of view, both the water code and the electric law embody institutional preferences that make hydropower cheaper than other power sources.

Above we discussed the fact that water is treated as free. In addition to this preference, the institutional differences between consumptive and non-consumptive water rights also affect the performance of power companies and the decisions of the CDEC. Because these two kinds of rights hypothetically are not in conflict, the CDEC does not consider the downstream externalities created by hydropower generation. Those costs are not considered by the CDEC in calculating the costs of hydropower generation.

The electric law and its preferences for hydropower

We saw above that the electric law allows the installation of any power station whenever the interested party wishes and without the requirement for any special previous administrative authorization. Furthermore, the electric law explicitly says that hydropower stations can be freely installed when the private sector desires and without special public approval (Article 4). However, hydropower developers can voluntarily request a special concession, through which they will be able to access privileges related to the use of public and private land for purposes of hydropower generation. These privileges include the rights to enter private or public land in order to study the viability of a hydropower project, and to flood other people's land for the construction of reservoirs, even against the will of the proprietors. Among different power sources, hydropower generators are the only ones that can access a concessional title that grants them benefits to carry out their activities, giving them a comparative advantage of an institutional nature, which is far from constituting a "neutral market decision."

As an institutional assurance for the previous situation, the economic rights enshrined in the Constitution of 1980 guarantee the right to "free access to hydropower concessions" (Evans 2003, Vergara 2004). According to the constitutional right to acquire all kinds of goods as private property (Article 19, No. 23), private individuals have the freedom to acquire property over the rights stemming from the hydropower concession. This would imply the power of the private companies to always obtain hydropower concessions so long as they fulfil the minimal requirements expressly ordered by the law. This means that the decision to grant the concession is not left to criteria established by the administration.

Benefits from the development of hydroelectric power stations are realized through the imposition of concessions for hydroelectricity on riverside property owners. Thus, in the case of a riverside property on which the construction of a reservoir is planned by whoever enjoys the privilege of a concession for hydroelectricity, the rights of the owner of the project could not be disputed once the concession is signed. This implies a restriction on the free use of the riverside proprietor's authority, who would not be able to exercise the freedom to exclude his or her property from market negotiations, but instead obliged to encumber his property in favour of the interests of hydroelectricity. If the riverside proprietor does not agree to a price, the amount would be fixed by a special commission which does not consider the land's value based on its hydropower potential. Thus, it is the institutional framework itself that values the river basins, in the way that it elevates the interests of hydropower over those of the riverside proprietor. This action can be understood

as favouring hydropower by lowering the transaction costs involved in acquiring land for hydropower uses (Prieto, 2007).

Other institutional preferences for hydropower

This final section briefly describes three additional ways in which the Chilean institutional framework favours hydropower over other resource uses. These are: (1) the process for resolving inter-sectoral water conflicts within the largest private associations of water users, the vigilance committees; (2) the national system for environmental impact assessment, as established in the Environmental Framework Law of 1994; and (3) judicial decisions and behaviour.

Conflict resolution and vigilance committees

In Chile, the main conflicts that have been identified over the construction or operation of hydropower projects are related to control over water rights, attributions of water rights, and the distribution of socio-ecological costs associated with the use of these powers.

With respect to these conflicts, the Chilean model of hydroelectric management presents the absence of state agency functions able to settle the conflicts, and the apparent absence of explicit legal privileges in favour of any particular use. Both ideas imply that it should be individuals who resolve their conflicts by private negotiations. In addition, the water code establishes user organizations whose principal role is to distribute the water and assure its correct use among water rights holders. Among these organizations, the *juntas de vigilancia* (vigilance committees) are especially important for coordinating inter-sectoral uses between consumptive and non-consumptive water rights.

When water resources are managed by a market-based system, it is supposed that the conflicts provoked will be resolved by means of private negotiations (Thobani 1995). According to Coase's theorem, if transactions costs are low and if property rights are defined clearly as private and tradable, the existing transactions within the market will carry the resource to the most highly valued uses, which would absorb the opportunity costs and the negative externalities. In order to participate in the market, the interested parties must meet as free agents within the same space of negotiation. Although that is the spirit of the water code, from the institutional perspective this does not occur because the differentiation between consumptive and non-consumptive rights generates separate markets, and because the switch from non-consumptive to consumptive uses is not legally permissible. Consequently, as mentioned above, the externalities generated when non-consumptive water rights are used to control water flows cannot be negotiated within the market. Even though this is never specified in the dominant literature, it is the result of an institutional definition of the object of the water rights.

For their part, the in-stream users of the resource, and especially those interested in the ecological value of water, lack the power to negotiate within the market, because they are originally excluded from ownership of the rights for water use and their right to acquire them in markets is limited. This is simply because the in-stream uses are not recognized by the institutional framework as eligible for property rights.

The vigilance committees are constituted by water rights owners in the same river basin. Their main objective is to administer and distribute the waters to which their members have the rights in the natural rivers (Article 266). The water code stipulates that all the owners of water rights in the river basin (both consumptive and non-consumptive) are to be included within these organizations. In practice, however, the rules for decision making within the

vigilance committees are biased in favour of the owners of non-consumptive water rights (Bauer 1998a). This is because the decisions are adopted according to the desires of majority shareholders, which are proportional to the number of rights. The water code does not distinguish between the holders of consumptive and non-consumptive water rights in this context. Since rights for non-consumptive uses can be granted for the same water at different points along the river basin, the non-consumptive water rights will often be more numerous and have more votes than consumptive rights (Bauer 1998a, Ríos and Quiroz 1995). As a result, the consumptive rights holders often do not include the hydroelectric representatives in the vigilance committees' meetings or decisions (Bauer 1998a).

Because the regulation of water emphasizes its productive uses rather than in-stream uses, the scope of the vigilance committees is restricted. People interested in in-stream uses are excluded from participating in decision making about how to manage resources in river basins, since they lack water rights. As a result, when conflicts arise between different users of water, the institutional structure marginalizes in-stream and non-extractive uses. To understand this, it is necessary to distinguish between conflicts between holders and non-holders of water rights, and conflicts between consumptive users and non-consumptive users.

People interested in in-stream water uses are restricted when it comes to access to water rights. Thus, they cannot be full agents within the market. In this sense, their abilities to negotiate for their interests within the market are restricted by the institutional framework.

In relation to conflicts between consumptive users and non-consumptive users, the two sides hold rights that are traded in different markets. They do not interact on the same platform of negotiation. As a consequence, if a consumptive user wants to negotiate the acquisition of non-consumptive water rights to absorb the externalities caused by their use, as mentioned above, he or she is severely restricted from doing so based on institutional arrangements.

Environmental Framework Law and system for environmental impact assessment

Since Chile has no obligatory land, energy, or water use planning, we might expect that the national system for environmental impact assessment (EIA) would play an important role in conflicts and externalities related to new hydropower projects. However, those hydroelectric projects that enter into the system of EIA, as required by the 1994 Environmental Framework Law, are presented in their final design. This implies that any analysis of possible alternatives, whether in terms of location, size, or technologies to be utilized, will not be performed. The discussion focuses on whether the projects satisfy the legal standards and how projects can mitigate their impacts. Experience has shown, however, that hydroelectric projects are almost never rejected. The EIA system operates to facilitate their legitimacy and realization (Tecklin *et al.* 2011), since it is designed to decrease transaction costs.

The role of the courts

Judicial decisions in water conflicts are a third example of institutional preferences for hydropower. Our discussion is very brief due to limits of space, but we have written about these issues in detail elsewhere (see Bauer 1998a, Prieto 2007).

According to Bauer (1998a), since the market is the main arena for solving water conflicts and the public water agency lacks the power to resolve them, courts will play a key role in solving water conflicts. This idea is reinforced by the new role that the Constitution of 1980 established for the courts.

Recent research by Prieto has updated and confirmed Bauer's argument in the time period up to 2007. According to Prieto (2007), the role of the courts is even greater in relation to hydropower, insofar as (1) there is no binding land-use planning or electricity planning; (2) the EIA facilitates the legal approval of the projects rather than mediating conflicts; (3) there is an imbalance of representation in the vigilance committees in favour of non-consumptive users and a lack of consideration towards in-stream users; (4) there are two markets (one for consumptive water rights and another for non-consumptive water rights), although the two uses conflict when a dam accumulates water; and (5) in-stream uses are marginalized as objects of water rights.

Conclusions

Free-market-based models for allocating water and managing power generation, inasmuch as they apparently emerge from a-priori rules, are often seen as neutral, natural, and part of an apolitical discourse. Following this idea, rooted in neoliberal concepts of freedom, the Chilean hydropower model and its orthodox analyses are presented as shielded against political influence in order to guarantee political freedom and economic efficiency in both water allocation and power generation.

In spite of this view, from an institutional perspective it is possible to see that this neutrality is an erroneous assumption. Following this idea, this paper has shown how the Chilean water institutional framework – the political, ideological, legal, and judicial framework – has shaped a specific conception of private property with regard to water rights uses and electricity generation, making them less pure than it would appear from the dogmatic neoliberal perspective. The institutional arrangements for water rights determine that the original allocation of water pertains exclusively to productive uses, and within them, with special preference to hydropower. Once water rights have been originally assigned to hydropower uses, it is very difficult for the market to operate as an instrument for the reallocation of those rights toward uses different than hydropower. That is because first, the tax for non-use makes the reallocation of non-consumptive water rights toward in-stream uses more difficult than the reallocation toward non-consumptive uses that require the capture of water. Second, the institutional difference between consumptive water rights and non-consumptive water rights creates two separate markets in which the externalities that hydropower imposes on other uses (e.g. irrigation) can rarely be the object of bargaining.

In addition, the electricity legislation establishes the right for hydroelectric investors to acquire, in privileged terms, riverside land in order to facilitate hydropower generation. The model for coordinating the operation of the different power plants does not take into account the opportunity costs generated by the control of the stream by the hydropower dams. Both previous elements, plus the free cost of water, determine in part the efficiency of water as a power source, making hydropower more competitive within the power grid.

The failure of the market and other institutional forums to resolve these conflicts, and the special constitutional recognition enjoyed by the right to private property, give the courts a special role within the hydropower institutions. The courts are zealous protectors of the institutional construction of private property, and are inclined to favour hydroelectric interests, especially when they are confronted with in-stream uses of water. Judicial rulings in the environmental legal conflicts studied show the economic disparity between the parties in conflict (Smith 1995).

Finally, based on the previous ideas, this institutional framework determines that (1) the valuation of water in streams is institutionally imposed in such a way that they are reduced to factors of production, leaving out the value of in-stream uses, and (2) it is established

institutionally that hydroelectricity is a cheap form of energy generation, to be developed freely and predominantly by economic groups with a high concentration of water rights. These findings show how the security of the property rights to non-consumptive water rights, and their uses in hydropower activities, is sustained only through institutional decisions that impose costs on other (consumptive) water rights, riparian property rights, and different interests that institutionally are marginalized as objects of property (such as environmental, cultural, recreational, and aesthetic uses).

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Notes

1. For a thorough review of the ideological background of the Chilean economic model, and its influence in the Chilean water and energy reforms, see Bauer (1998a, 1998b) and Prieto (2007).
2. Based on Bórquez (1986) and personal communications (2007) from two anonymous DGA officials.
3. See Orrego v. Empresa Eléctrica Pangue (Corte Suprema, May 8, 1993).
4. According to the report of the DGA to the Court for Defense of Free Competition (see DGA 2006).
5. For more details about the history of this discussion, see Bauer (2004).
6. See details in Prieto (2007).

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