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Greening the European economy at the expense of other world regions? Tracing the EU's quest for green hydrogen in Chile

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Introduction

The EU's green agenda connected to the European Green Deal (2019) is a reaction to the polycrisis characterised *inter alia* by the climate crisis, an energy crisis, and a crisis of overaccumulation, evolving in a context of growing geopolitical tensions. In this environment, the EU executive bodies – backed by transnational capital – decided to adopt a green growth strategy to restore profits based on the decarbonisation of the European industrial, energy and mobility systems (EC, 2019).

Hydrogen is of central importance to master the EU's energy transition due to its capacity to store energy and thereby stabilise electrical grids, and its ability to decarbonise hard-to-abate sectors which are difficult to electrify (Pepe et al., 2023). Furthermore, so-called 'green' hydrogen requires only inputs of renewable energy and water and can therefore be produced almost anywhere. This makes it an attractive solution to energy security concerns, and also a seemingly promising field for new

investments. However, only green hydrogen has a favourable CO2 balance, whereas grey, brown, black, blue and turquoise hydrogen require fossil fuel inputs and thus result in higher emissions (for a detailed overview, see Ajanovic et al., 2022). Due to this, our paper exclusively deals with the projected production of so-called 'green hydrogen' (GH2) with electrolysis using low-carbon energy sources like solar or wind power.

The EU Commission targets 10 million tons of low-carbon hydrogen production in the EU plus an additional 10 million tons of imports by 2030 (EC, 2022) – about 20 per cent of the current global hydrogen production (International Energy Agency, 2024). To create the capacities for the targeted supply, the EU aims to cooperate with potential producers in the Global South. While EU documents frame these cooperations as mutually benefitting partnerships, dependency scholars would argue that the EU's GH2 agenda has the potential to lock in countries in the Global South in an unhealthy specialisation in hydrogen generation for exports. Based on this consideration, we examine how the EU's quest for GH2 influences the prevailing dependency relations with Chile.

Despite their distance, the EU regards Chile as a possible trading partner because of its extraordinary renewable energy potential and their overall friendly relations. Considered a 'trusted ally' (Dejonghe, 2023), it could become a back-up for the EU in times of geopolitical tensions. In 2022, these two actors established a Team Europe Initiative to promote the production of GH2 in Chile, and the country also advances national GH2 policies. However, as Chile finds itself in a peripheral position in the global division of labour (Dos Santos, 2002: 12), the EU's quest for green hydrogen could also have negative economic and socio-ecological implications for Chile.

Theoretically, we draw on considerations from the dependency approach based on which we developed categories to investigate our case study. Methodologically, we used deductive qualitative content analysis (Mayring, 2015) to analyse eleven expert interviews conducted with different actors in Europe and Chile between February and October 2024, as well as the most important official documents connected to GH2 policies.

In the first section, we introduce the theoretical framework of our analysis. Then, we analyse the politico-economic context of the emerging hydrogen economies in the EU and Chile. Lastly, we discuss how different dimensions of dependency materialise in the Chile-EU relations and assess which are the implications of the emerging hydrogen cooperation for the dependency relations between the EU and Chile.

Dependency Approach

In our analysis, we rely on basic assumptions of the dependency approach which developed in the late 1960s with a regional nucleus in Latin America. It had different strands, but they shared the assumption that Latin American countries had a disadvantageous, ‘peripheral’ position in the international division of labour due to their specialisation in raw material exports and their dependence on imports of industrial goods from the ‘developed’ centres in Europe and North America. However, attempts to build their own industries did not end structural dependency but rather intensified the reliance on foreign capital and technology. This significantly limited their developmental choices, and reproduced their distorted economic structure, characterised by few domestic linkages and high dependence on external demand (Caporaso, 1978: 13; see also Cardoso & Faletto, 1979).

Dependency thinking inspired the scholars who developed the world-systems approach. They still perceived the global division of labour as hierarchical but put more emphasis on the fragmentation of production, assuming that a country's position in the world system determined how much profit it could draw out of the participation in commodity chains. In the 21st century, this more holistic perspective was replaced by the 'global value chain' approach which has a stronger focus on the micro level, and analyses how firms act at a particular node of a chain, who controls the chain, and which opportunities firms encounter for moving up the chain, so-called 'upgrading' (Fischer et al., 2021; Gereffi & Fernandez-Stark, 2016). More recently, the challenges of upgrading, connected also to asymmetric power relations, have received increased attention (Lee et al., 2018)

Given the instability of commodity-based growth models, continuing power asymmetries and the growing demand for resources and 'clean' energy due to the digital and green transition, the dependency approach has received renewed interest (Madariaga & Palestini, 2021). We consider it a suitable approach to examine the Chile-EU relations from a Chilean perspective, drawing on the following categories deductively isolated from dependency scholars' and global value chain analysis' theoretical observations. First, we will analyse Chile's (subordinate) position in the global division of labour with a special focus on GH2. Relevant factors are *import dependence on foreign technology and capital* (loans, foreign direct investment including profit repatriation), provided under the primacy of the US dollar, as well as *commodity export dependence* coming along with a one-sided specialisation, making a country vulnerable to international demand and prices. Both tend to be in disbalance, leading to a trade deficit. Inside the peripheral countries, this peculiar insertion into the global market leads to a distorted domestic economic and social structure,

characterised by structural heterogeneity. The latter involves the coexistence of marginal sectors and technologically advanced, export-oriented industries which can become enclave economies with few linkages with the rest of the economy. Furthermore, free trade agreements, the power to impose certification standards and transnational companies' actions to preserve the *control of global value chains* play a crucial role in reproducing dependency structures. Before applying these categories to the EU-Chile relations, we will shortly introduce which considerations shape the EU's hydrogen agenda.

The EU's Strive for Green Hydrogen

As stated in the introduction, the EU faces a polycrisis which it seeks to tackle through the stimulation of (green) growth based on an ambitious decarbonisation agenda (Vezzoni, 2023). In this context, the European Green Deal (2019) declares the goal to make Europe the first climate-neutral continent by 2050 but mentions the term 'hydrogen' only three times, while the accompanying annex with the roadmap of the key actions does not mention it at all (EC, 2019).

In the following, intensive lobbying by private capital took place which contributed to a 'hydrogen hype' (Balanyá et al., 2020). Fossil fuel industries spearheaded this process, particularly gas suppliers and gas network operators seeking to compensate for their potential losses from an announced gas phase-out. In opposition to environmental NGOs and critical scholars, they sought to label other, fossil fuel-based hydrogen variants as 'clean' or 'low-carbon' alongside GH2 and advocated for broad usage of hydrogen not limited to hard-to-abate sectors (Balanyá et al., 2020). Their lobbying led the EU to adopt a more favourable position towards hydrogen production and usage (Vezzoni, 2024: 7-8, 13). This already materialised in the 2020 published 'hydrogen

strategy for a climate-neutral Europe' (EC, 2020a), and it probably influenced the European Hydrogen Bank, which was launched in 2022 to de-risk investments in hydrogen, to include even grey hydrogen in its first auction bid in 2024 (Marcu et al., 2024: 2). Therefore, it is not surprising that the Commission stated regarding the European Clean Hydrogen Alliance that it wanted '[i]ndustry in the driving seat, especially companies with significant investment potential into clean hydrogen' (EC, 2020b).

According to the green growth paradigm, the EU seeks to create a hydrogen market. In addition to the fossil lobby, different actors in the EU back this endeavour, for example, potential producers of GH2, capital seeking for green investment opportunities, technology manufacturers as well as potential traders and consumers of GH2, particularly energy-intensive industries. However, the current production costs of GH2 are not competitive in comparison to fossil fuels (Rupérez Cerqueda, 2023: 41). The International Renewable Energy Agency (IRENA, 2022: 10) points out that one reason for this is that hydrogen 'is a conversion, not an extraction business.' The lack of rentability makes it difficult for project developers to de-risk their investment by concluding long-term off-take agreements (Gomes et al. 2024). This means that the production and usage of GH2 is currently not profitable without subsidies, neither in the EU nor in Chile (Rupérez Cerqueda, 2023: 38). Thus, EU-launched financing instruments like the European Hydrogen Bank might support the erection of an inefficient energy supply model.

Furthermore, it is contested how much renewable hydrogen imports the EU actually will need. The Russian invasion of Ukraine and the resulting attempts to accelerate the phase-out of Russian gas motivated the European Commission in 2022 to publish the REPowerEU plan, which reiterates the targets of 10 million tons of GH2 production in

the EU and an additional 10 million tons of imports (EC, 2022). However, the European Court of Auditors published a report in summer 2024 strongly criticising the Commission's hydrogen policies and their 'unrealistic' targets (European Court of Auditors, 2024: 20), assessing that in Europe 'the demand expected to be stimulated will not even reach 10 Mt by 2030' (ibid.). If the EU's hydrogen imports remain below expectation, this might also have a negative impact on Chile, with which we will now deal more in detail.

The Chilean Hydrogen Policies

The Chilean hydrogen policies follow the overarching motive to turn Chile into a key player in the global hydrogen market. The central documents pertaining to Chile's hydrogen policies are the Chilean National Green Hydrogen Strategy, published in 2020 by the right-wing President Sebastián Piñera's government, and the Green Hydrogen Action Plan, published in 2024 by the successor government led by center-left President Boric. Despite the change in government, the 2020 strategy which outlined the development of an export-oriented hydrogen economy in Chile was continued without significant changes in the 2024 action plan. The policies aim to take advantage of the country's extraordinary potential for renewable energy production in its northern region Antofagasta and southern region Magallanes to 'become a world leader in the production of this clean fuel' (Government of Chile, 2024: 8). Hydrogen would mainly be exported in the form of its derivatives ammonia and methanol, with the EU as key destination market and Japan, Singapore and South-East Asia as other potentially relevant off-takers (Interview 7, 2024, Pos. 253).

The hydrogen policies form part of the market-based approach of Chile's broader energy transition policies. These policies have been described as a 'neoliberalisation

of energy governance' (Furnaro, 2020: 952) facilitated by technocratic decision-making (Flores-Fernández, 2020). Allain and Madariaga (2020) argue that the Chilean energy transition needs to be understood within the overall politico-economic context strongly embedded in global markets and characterised by a neoclassical hegemonic discourse. Chile is an open, export-oriented economy which is highly dependent on commodity exports, above all copper, and dominated by the interests of few large domestic and international business groups (Bril-Mascarenhas & Madariaga, 2019). This structure is to a significant extent the consequence of the neoliberal restructuring of the Pinochet dictatorship, which resulted in a state with severely limited capacities, struggling to plan and implement large policy initiatives such as the energy transition (ibid.; Allain & Madariaga, 2020).

In the hydrogen sphere, the Chilean state works closely with business actors, international institutions and foreign agencies, and refrains from direct market interventions. Due to its neoliberal legacy, the role of the Chilean state is limited to being the 'facilitator, coordinator, and promoter' (Government of Chile, 2020: 22) of hydrogen development. Its insufficient capacities also partly explain the strong role of international institutions and foreign agencies in policy development. For example, the German development cooperation GIZ was a key partner of the Ministry of Energy and provided expertise, technical studies and acted as an 'interface between the government and private [sector, J.R.]' (Interview 9, 2024, Pos. 48). Similarly, the Ministry of Energy cooperated with the World Bank, which led to the creation of a loan-backed 1 billion USD financial facility to mitigate risks for private investors that we will discuss in more detail below (Interview 11, 2024, Pos. 44).

However, growing public opposition criticises the lack of transparent long-term planning by the state. Most notable is the popular movement "Panel Ciudadano H2

Magallanes" in the geographically isolated and sparsely populated region of Magallanes. In 2023, the movement wrote an open letter to the government, warning about the far-reaching socio-ecological effects and highlighting that the exploitation of the region's renewable energy potential by foreign companies for foreign consumers neither contributes to regional decarbonisation nor creates significant benefits for local communities. Thus, the movement urged the state to stop hydrogen development, to assess the socio-ecological implications of GH2 production for the whole region and to reevaluate its policies based on the outcomes (Panel Ciudadano H2 Magallanes, 2023). Despite the growing opposition, the state continues to promote large-scale export-oriented hydrogen projects, framing them as an opportunity for sustainable economic growth. However, this policy orientation might reproduce or even reinforce existing dependency relations, as we will analyse in the following section.

Import Dependence on Foreign Financial and Technological Capital

The development of hydrogen production in Chile relies on foreign direct investment (FDI). Although Chile has investment grade A- (FitchRatings, 2024), and the Climatescope-Index 2023 (Mitri et al., 2023) names Chile as the third most attractive country for investments in renewables, it needs additional foreign funding. FDI 'is mandatory. Otherwise, it wouldn't happen. I don't know any project that is exclusively based on Chilean capital' (Interview 2, 2024, Pos. 158-159). Currently, several measures are in place to attract investors to Chile, for example, tax credits and public co-financing in the framework of the Chilean GH2 Action Plan.

Chile receives significant financial support from the EU and single member states to purchase European technology and machinery, and to develop GH2 projects that might

benefit the EU in the medium or long run. To this end, the Team Europe Initiative ‘GH2 development in Chile’ created a ‘Renewable Hydrogen Funding Platform for Chile’ (European Investment Bank, 2023). It draws on the Chilean agency for productive development CORFO to channel the money to renewable hydrogen projects (Team Europe Initiative, 2022). CORFO will create a proper financial facility

> to catalyse private investment primarily by providing State backing to reduce and mitigate financial risks of projects (...). The Facility will have an initial size of around US$1,000 million, largely financed by International Development Banks (IDB, World Bank, KfW, EIB, CAF, among others), in addition to CORFO's own resources (Government of Chile, 2024: 87).

The CORFO facility includes several loans from the listed international lenders with different conditions and measures for risk mitigation. The measures focus predominantly on the supply side (that is, GH2 production projects) and include funding for the acquisition of equipment (above all, electrolysers), credit lines, guarantees, debt service reserve accounts as well as liquidity reserve accounts for technical complications during early operation (Interview 11, 2024, Pos. 15-21). This dependence on foreign funding enables financial institutions to enforce conditionalities on Chile, and it bears the potential threat that profits are repatriated or that investments are withdrawn or partly rechannelled if they seem to be more promising elsewhere.

Commodity Export Dependence

The Chilean hydrogen economy has always had a clear export focus, which recently intensified. Whereas in 2020 the strategy aimed to ‘leverage our domestic base to scale into a key player in export markets’ (Government of Chile, 2020: 18), by 2024,

this approach had reversed. During an Interview, an employee of the Chilean Ministry of Energy stated that '[w]e rather need the economies of scale that large export projects give us, so that we can also decarbonise the country, not the other way around.' (Interview 7, 2024, Pos. 99). Local demand would materialise as soon as the scaling up of the export sector had reduced the prices. This turn is strongly related to the lack of local demand by potential consumers like the mining sector (ibid., Pos. 67-68), which further increases the dependency on international demand for GH2 exports and thereby aggravates risks for hydrogen producers and the Chilean state.

The overreliance on external demand is particularly problematic as there are few markets with relevant levels of demand for imports, 'like the EU and maybe Asia' (Interview 3, 2024, Pos. 73-74). Furthermore, as already mentioned, the EU's import targets for 2030 rely on unrealistically high demand estimates. Currently, the demand for GH2 is limited due to high prices and many uncertainties related to production, transport, and consumption (Gomes et al. 2024). This is also a key issue for project developers, as 'what is actually needed is demand. (…) Since there is not a lot of demand, we advance really slowly' (Interview 6, 2024, Pos. 321-322).

However, even if international demand would increase, the specialisation on GH2 exports entails the risk to perpetuate the prevailing dependency relations. Unequal trade relations will be reinforced if Chile provides GH2 in exchange for financial and technological capital (for example, electrolysers) from European companies (which is the exchange model favoured by Germany, according to interview partners 1 and 4). Another potential threat is the emergence of enclave economies, particularly in the already mentioned region of Magallanes, where the geographical isolation hampers the attraction of new industries and labour resources (Interview 2, 2024, Pos. 170-172), and is therefore likely to produce few local linkages.

Control of Global Value Chains

In the field of GH2 production and trade, a global race for technology leadership and shaping the rules of the market is taking place. ‘China, Europe and Japan have developed a strong head start in producing and selling electrolysers, but the market is still nascent and relatively small. Innovation and emerging technologies can change the current manufacturing landscape’ (IRENA, 2022: 15). To decrease its external dependence, Chile has announced to promote the proper production of electrolysers and other products connected to GH2 production (Government of Chile, 2024: 166-170). This is congruent with the current industrial policy discourse which recommends attempting to climb up the value chain or to upgrade into higher value-added chains for catch-up development (Gereffi & Fernandez-Stark, 2016; UNIDO, IRENA, & IDOS, 2023). Additionally, downstream the value chain, the state aims to attract energy-intensive industries such as steel to Chile, according to the vice-executive of CORFO:

> So, this generates an opportunity in the value chain as developers or providers of technology (…) And another topic is what will happen in the future with traditional industries that need a lot of energy, they will then need green energy (…) they will move physically close to where these energies are produced. I think about steel, I think about cement, I think about data centres. (Benavente, 25 April 2024, 01:08:40 – 01:09:21)

Apart from official narratives, however, there are several issues complicating the actual potential for upgrading, both upstream and downstream. First, Chile’s already mentioned geographical isolation from relevant markets and the lack of technological and human capital. For example, the Energy Transition Index 2023, an index by the World Economic Forum tracking the progress of 115 countries in their energy

transitions, ranks Chile 30 globally, and fourth in Latin America. It identified innovation, education, and human capital, as well as equity and sustainability as Chile's weak points (World Economic Forum, n.d.). Second, the lack of state capacities and willingness to incentivise private actors through direct interventions in the market, for example using subsidies or quotas. Local sourcing quotas for hydrogen producers to promote upstream upgrading or off-take quotas for local consumers to promote downstream upgrading are not on the table as they would break with the historically neoliberal role of the state in vis-a-vis Chile's economy (Interview 7, 2024, Pos. 128). Furthermore, the state simply lacks the financial resources for subsidies of any significant level. For example, regarding Chile's plan to attract electrolyser manufacturers to Chile, an interview partner stated that 'I doubt it [works, J.R.] (…) The government wants to create 10 million dollars in subsidies. (…) but how much really is 10 million dollars, of all the investments you need to make?' (Interview 6, 2024, 192-199). Due to these constraints, another interviewee emphasised that the upgrading opportunities for Chilean producers are limited:

> So, a lot of the electrolysers are probably going to become manufactured somewhere else. But there's still a lot of other things that you could manufacture locally, like the pipelines, the screws, cables, there's a lot of which is sort of semi high-level development (Interview 3, 2024, Pos. 189-190)

Additionally, the EU has several measures at hand to further complicate Chile's upgrading. First, in 2023, the EU and Chile signed an 'Advanced Framework Agreement'. The Energy and Raw Materials (ERM) chapter of the treaty prohibits Chile to have export or import monopolies for raw materials, to introduce export restrictions directed against the EU, and to offer its raw material and energy resources to local

enterprises at preferential prices (Groneweg, 2019: 16-19). With these new regulations, the EU can undermine the upgrading of Chilean companies. Other potential actions that the EU could introduce at later stages are, for example, export controls for electrolysers to impede technological catch-up in Chile, or to hinder the market entry of Chilean producers if they are successful in producing their own electrolysers, as the EU currently does with China (Berkel, 2024). Moreover, the newly signed agreement also contains protective provisions that allow investors to sue states if political decisions threaten their interests, which might become problematic in case that the Chilean civil society increases its resistance against new investment projects and the government would conform with their demands.

Furthermore, European-led firms control the GH2 value chains and play a key role in the Chilean GH2 market. Energy companies such as French EDF, Engie or Total Eren as well as Italian ENEL provide the necessary technological and financial capital, and of the 64 projects that have been announced so far, the majority is at least partially implemented by European corporations or investors. Table 1 shows the six biggest projects, which feature several European companies such as SIEMENS, TEG, Total Eren and EDF.

Project	Capacity (MW)	Market	Company	Country	Region
H2 Magallanes (Total Eren)	8000	Export	Total Eren	FRA	South
HNH Energy	1400 (up to 6000)	Export	Austria Energy, CIP, Ökowind	AUT, DNK	South
Acuario, Sagitario	2500 + 2500	Export	Consorcio Austral	CHL	South
Gente Grande	3200	Export	TEG Chile	UK	South
Los Amigos del Verano	2500	Export + Internal	SIEMENS, Verano Energy	GER, CHL	North
Energía Verde Austral, Punta Delgada	1000 + 1500	Export	EDF Andes, EDF Renewables	FRA	South

Table 1: The six biggest hydrogen projects in Chile by November 2024 (H2Chile, 2024).

It is important to note that, as of October 2024, no final investment decision has been taken for any of the bigger projects (Interview 10, 2024, Pos. 77). A reason for that is that 'they compete with other projects (…) in Morrocco, Namibia, Oman (…) which country gives the best signal' (ibid.). This competition for financial and technological capital could lead to a 'race to the bottom', in which 'the countries offering the best locational conditions, because the wages are low or because labour rights are ignored, can score' (Interview 4, 2024, Pos. 113). In fact, competition was used as a leverage to pressure for business-friendly policies. For example, during interviews, business actors argued that Chile would need to simplify the issue of permits or speed up environmental evaluation to remain competitive with actors like Uruguay (Interview 6, 2024, Pos. 120-230).

Another key aspect shaping the development of global hydrogen value chains constitutes the power to define a standard with clear criteria for hydrogen trade and certification, as they strongly determine how GH2 is produced or rather what is considered as 'renewable hydrogen'. IRENA (2022) highlights that 'shaping the rules, standards and governance for hydrogen trade will have a significant impact in determining which technologies dominate future markets' (p. 16). With the first global

definition of the criteria for renewable hydrogen, the so-called RFNBO criteria, the EU in 2024 brought itself in the pole position by setting the benchmark for other actors. A representative of an international consultancy strongly involved in Chilean and European hydrogen relations criticised the European approach as ‘very Eurocentric, completely geared towards the fulfilment of their own objectives (...). There are no criteria that require sustainability in the economic, social or environmental sense’ (Interview 8, 2024, Pos. 375-383).

Lastly, international development cooperation can also serve as a means to control value chains. Close bilateral cooperation connected to GH2 exists between Chile and Germany, with the latter being particularly active in promoting its hydrogen-related interests abroad, most notably through the German development agency GIZ. It plays an important role in the development of Chilean energy transition policies at least since 2014 and co-developed hydrogen policies as part of its cooperation with the Ministry of Energy (Interview 9, 2024, Pos. 5-11). However, rather than just providing technical support, the GIZ was described as ‘an actor between the German government, German businesses and Chile (…) with the goal to improve investment opportunities for German businesses’ (Interview 5, 2024, Pos. 68). An example is the business association H2Chile, founded on initiative of the GIZ, which represents domestic and international business interests vis-à-vis the state (Interview 9, 2024, Pos. 37-38). Its members include key European corporations such as SIEMENS, MAN, EDF, Total Eren, Engie, Linde, and so on. (H2Chile, n.d.). Another interview partner stated that German foreign policies on hydrogen are not motivated by an ‘interest in (…) development cooperation’, but rather by the ‘interest in asserting technological leadership’ (Interview 4, 2024, Pos. 41). Thus, the GIZ’ promotion of GH2 in Chile

shows how development cooperation can be used as a tool to shape the emerging hydrogen economy according to corporate interests.

Conclusion

In this chapter, we examined how the quest for GH2 is inserted in the EU's broader attempt to overcome the polycrisis by implementing a tight decarbonisation agenda based on a green growth approach. As the EU proclaimed the target to import half of the ostensibly needed 'renewable' hydrogen, and Chile is one of the globally most promising future producers of GH2, we asked how the EU's strive for green hydrogen might influence the prevailing dependency relations with Chile. We formulated the thesis that a specialisation in GH2 for exports had the potential to lock-in countries in the Global South in an unhealthy specialisation on low value-added and volatile export of energy goods. We examined this thesis based on the dependency approach, which we deductively operationalised by formulating categories which we grouped in three dimensions of dependency. In the methodological realm, we drew on the insights from 11 expert interviews conducted with different stakeholders connected to the hydrogen economy in Europe and Chile as well as on official documents outlining GH2 policies in both regions.

Regarding *import-dependence on financial and technological capital*, we identified typical dependency patterns. European capital seizes investment opportunities around the globe and seeks to export its technology (for example, electrolysers) to the Global South. With the European Hydrogen Bank, it can draw on a proper financial instrument to de-risk investments in renewable hydrogen production, which means that it is less of a problem for them that GH2 production is currently not profitable. These export interests are mirrored by Chile's import dependence on foreign technology, because it

(currently) cannot produce electrolysers on its own, and on foreign capital for GH2 investments, of which large part stems from the EU in the framework of CORFO's financial facility. This situation is likely to reproduce dependency, because the lenders (for example, the EU) can enforce conditionalities on Chile, repatriate benefits or threaten withdrawal of investments, while the recipient Chile risks worsening its debt issue and the trade deficit with the EU.

In relation to *commodity export dependence*, the EU is in the comfortable position to focus on the supply of its domestic market and will probably neither need as much imports as projected nor will it depend on exporting GH2 to other world regions, which is totally different for Chile. Chile's strategy is strongly export-focused, also due to the lack of sufficient local demand for GH2. This further increases the investment risks for private investors and the state. In addition, the global market structure with limited centres of demand makes Chile highly vulnerable to demand shortfalls. In combination with the lack of domestic demand this creates a situation in which the overall development of the industry remains up in the air, which might still be better than a disadvantageous one-sided specialisation and would also avoid negative socio-ecological effects. In case that the GH2 industry develops, Chile faces the risk of creating enclave economies, especially in its Southern region, with few linkages with the rest of the economy.

Looking at our case study from a *value chain perspective*, we can see how EU companies control the required financial resources and technology and therefore dominate the whole GH2 value chain. Chile would want to promote upgrading in the chain, but several issues like geographical isolation, lack of financial, technological and human capital as well as lack of willingness and capacities for state intervention

convert this into a huge challenge. In addition, the energy and raw material chapter contained in the EU-Chile free trade agreement severely restricts Chile's policy options to regulate its own GH2 market and to upgrade in the GH2 value chain. Another factor limiting the national control over value chain creation was the strong involvement of foreign agencies like GIZ shaping Chile's GH2 policies which led to the promotion of the interests of foreign public and private actors in Chile's H2 development.

Furthermore, as GH2 can be produced in many different countries, EU-based firms use their power as a leverage to pressure Chile to offer them better investment conditions. This could trigger a race to the bottom regarding social and environmental standards in the Global South. Additionally, production conditions and the structure of value chains are strongly shaped by GH2 standards and certification criteria, which the EU has pioneered and where it is clearly prioritising its own objectives while neglecting social and environmental criteria.

Thus, the promotion of GH2 production for export in Chile has the potential to perpetuate the prevailing dependency relations between the EU and Chile, thereby potentially causing devastating social and ecological effects in the peripheral country.

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Appendix

List of Interviews:

Interview 1 with representative of IG Metall (Online, 06/02/2024)

Interview 2 with Austrian investor and project developer in Chile (Vienna, 22/05/2024)

Interview 3 with analyst at IRENA (Online, 24/05/2024)

Interview 4 with German hydrogen researcher (Online, 06/06/2024)

Interview 5 with Chilean-based German journalist (Online, 06/06/2024)

Interview 6 with employee of EU-based Energy Corporation developing GH2 projects in Chile (Santiago, 23/09/2024)

Interview 7 with employee of Chile’s Ministry of Energy (Santiago, 26/09/2024)

Interview 8 with representative of international hydrogen consultancy (Santiago, 26/09/2024)

Interview 9 with coordinator at GIZ (Santiago, 27/09/2024)

Interview 10 with representative of CORFO (Online, 04/10/2024)

Interview 11 with coordinator at World Bank (Online, 07/10/2024)