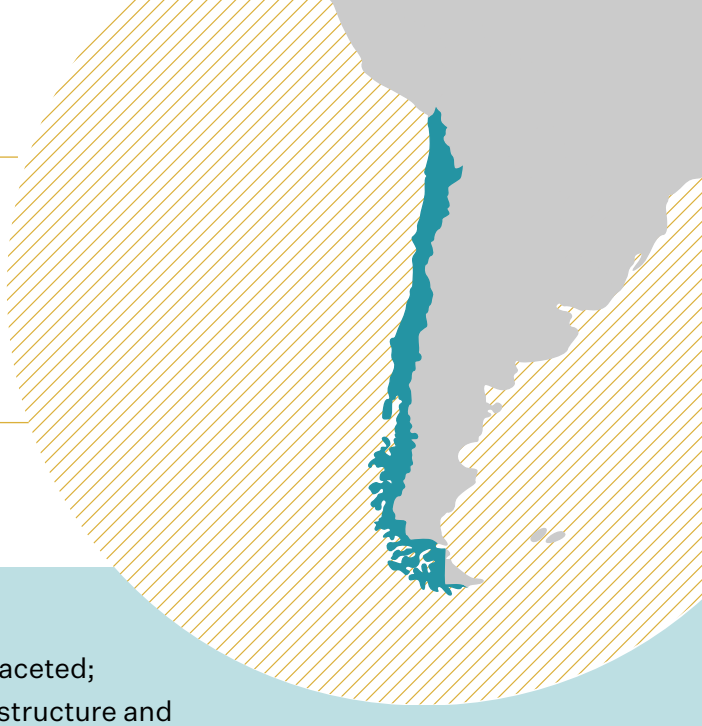

CHILE

Finding possibilities to apply artificial intelligence in an existing research financing ecosystem

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Key takeaways:

- Challenges in Chile around AI for science are multifaceted; primarily there is a lack of funding, resources, infrastructure and capacity and skills for AI.
- Priorities for AI have not been identified at the national scale and universities may be working in silos. Whether a unified vision for AI for science will exist in the near future in Chile is not yet clear.

Chile gained a National Artificial Intelligence Policy in 2021, after a two-year formulation process in which more than 1,300 people participated (MinCiencia, 2021). The policy is formulated in three pillars: enabling factors, R&D, and governance and ethics. The proposed guidelines have a ten-year scope and involve several public and private agencies, which are coordinated by the Ministry of Science for these purposes.

It must be noted, however, that the policy is not a binding instrument; the guidelines are not explicit mandates but proposed courses of action, which implies certain enforcement difficulties. In this sense, the policy also does not define priorities in the area of R&D project financing in any significant way.

The larger research financing ecosystem

The Chilean research and development (R&D) ecosystem is relatively small compared to the average in the Organisation for Economic Co-operation and Development (OECD, no date). The percentage of Chile's gross domestic product allocated to R&D amounts to 0.36 percent, while in the OECD it is 2.68 percent, meaning the relative investment in Chile is seven times lower. At the same time, the system is highly dependent on public funding, which represents 57 percent of total investment (MinCiencia, no date a). In nominal terms, in 2021 total investment reached USD 1.138 billion, USD 648 million of which was public investment.

These amounts represent the total investment in R&D, including talent training, basic and applied research and technology transfer. Forty-one percent of public investment is managed through the National R&D Agency (ANID), which reports to the Ministry of Science and Technology, while 15.5 percent is resources invested by the universities and comes from the national budget through fiscal contributions or undergraduate university

tuition subsidies (DIPRES, 2023). The remaining 30 percent depends on various agencies with specific mandates, such as the Development Corporation or Public Technological Institutes in specific areas such as fisheries, agriculture or aerospace research. International contributions, for example from observatories, are included in the ANID amount.

Public funding to research

The Chilean public funding system covers the whole researcher career, starting at the formation of advanced human capital, its insertion into industry or academia, the development of long-term individual and associative research projects, as well as infrastructure for centres and universities (MinCiencia, no date b). All of the above is financed through competitive calls, with award rates that vary between 8 percent and 30 percent depending on the instrument (ANID, 2022). The evaluation of the projects is carried out by national academic peers, grouped in 'study groups' that are nominated by collegiate scientific committees representative of the different sectors that participate in the ecosystem (universities, research centres, scientific societies and academia). Currently about 1,500 national researchers participate in 52 study groups, and 120 international peer reviewers evaluate the largest competitions (over USD 1 million) (ANID, no date).

Local research, however, lacks significant targeting and prioritization mechanisms as well as mandates to prioritize. A full 87 percent of public investment in R&D – USD 564 million – is allocated to 'open skies' projects, whether for the formation of advanced human capital or for individual or group research (MinCiencia, no date a). The remaining 13 percent of public R&D investment is mainly housed in the Public Technological Institutes, which have specific mandates from the government. This freedom of research transcends public funding and is also a differentiating element of the university ecosystem, composed of 56 universities, where more than 80 percent of the national knowledge-generating community is concentrated (MinCiencia, no date b).

In summary, the Chilean R&D ecosystem is small compared with the OECD average, with little prioritization in the allocation of resources and high dependence on public funding. Nevertheless, it has solid and transparent mechanisms for the evaluation of highly competitive projects for the entire trajectory of researchers' development, oriented mainly to individual research projects. The impact of Chilean publications measures close to the OECD average, and thus the impact achieved per dollar of investment goes well beyond the average.

The arrival of artificial intelligence

In terms of prioritization of sectors and funding practices, the Chilean R&D ecosystem faces challenges from AI. Being a highly atomized system in terms of project evaluation, many evaluators are not trained to properly assess the impact that the use of AI or machine learning tools can have on research, so more orthodox approaches outside of the science, technology, engineering and mathematics (STEM) disciplines are likely to be prioritized. On the other hand, in the absence of prioritization or targeting mechanisms in specific sectors, the development of these competencies in the academic community depends profoundly on what the host institutions – mainly universities – do. However, the lack of

base funds for universities in this area means they need to prioritize other policies rather than the continuous training of their academic staff. There is no mandate for universities to move in this direction, nor are there any competitive mechanisms to encourage work along these lines.

In this sense, the integration of AI tools in interdisciplinary research depends on the ability and possibility of researchers to articulate around specific projects for particular funding calls – which must be evaluated by peers who do not have the tools to understand their impact – or else focus on particular STEM study groups. This phenomenon means that interdisciplinary projects using AI compete for funds with AI-focused R&D projects, which ultimately may discourage the AI community from collaborating with other disciplines. Addressing AI governance issues has led to more international collaboration which has encouraged academic collaboration.

Training and talent

In terms of training and retention of talent, since 2019 there has been a relative increase of 15 percent in funding for the training of advanced human capital at the local level, with a decrease of 12 percent in funding for master's and doctoral degrees abroad (ANID, no date). This is consistent with the maturation process of the local university system in general. However, in disciplines such as AI it represents a challenge, since the community is less mature and therefore there is less quality supply than in disciplines like astronomy or biochemistry. This means that the speed at which the community has been growing is decreasing, which limits the possibilities for interdisciplinary research. Similarly, the growing interest of the private and public sector in the adoption of AI tools at the international level has generated a significant increase in the demand for advanced human capital, which means that the salaries offered by academic research careers are less competitive than five years previously. Consequently there is a shortage due to better working conditions outside the academy. Although the talent gap that will be faced in the future seems evident, there are no concrete efforts on the part of the private sector to significantly promote talent development on a national scale.

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Infrastructure and data

In terms of infrastructure, Chile lacks national laboratories or 'big facilities' with open access to the academic community. The development of AI models requires access to computing infrastructure, either physical or cloud, which is increasingly expensive due to the generalized increase in demand. This lack can be a significant impediment to the adoption of AI tools in an interdisciplinary manner, or a concentration of tools in university institutions with the resources to fund them.

Data access and governance for AI systems is also a structural weakness of the local system. A policy of open access to state-funded research data started in 2022, but the academic community is still reluctant to embrace this openness. There is no culture of standardization of data formats, which means that in many disciplines curatorial work is required prior to their availability. This lack of standards is also reflected in privacy and access policies, which depend on what is established by each university or even faculty within the university. All of the above translates into a substantive challenge for the adoption of AI in an interdisciplinary manner.

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