

Trends and Challenges in Doctoral Education in Chile

Introduction

In line with the global discourse on human capital accumulation as indicator of capacities for innovation and productivity, advanced human capital has been recognized by the Chilean government as an important driver of economic and social development (CONICYT 2008, 2012, 2013a). There is a widely held vision among policy makers that highly skilled professionals are crucial for scientific and economic advancement in Chile (Consejo Asesor Presidencial 2008). Thus, numerous initiatives have been developed to increase the numbers of doctorate holders, promoting scholarships for people to pursue a PhD abroad or within the country.

Two main features characterize doctoral education in Chile. First, there has been a rapid increase in enrollments in doctoral programs and of scholars with a doctoral degree. Second, the rapid increase of doctoral education has not been matched by increases in research funding and jobs in academia, so that doctoral holders find themselves trapped in a situation where there is a lack of funded demand for their skills in the system.

The Profile of Doctoral Education in Chile

The last 50 years have seen an accelerating expansion of doctoral programs and enrollments in Chile. There were just 16 programs in the mid-1980s, with 97 students, reaching 284 programs in 2017 and over 5,500 students, 60% of which are male. From 16 graduates in 1985, the figure has gone up to 685 in 2015. The number of doctoral graduates has multiplied by 42 in the last 30 years (Baeza 2017, 180).

To these, Chilean students pursuing Ph.D.s outside of Chile must be added, to gauge the magnitude of the doctoral education endeavor in Chile. Scholarships awarded are a good proxy for the numbers of doctoral students abroad, for most of them fund their studies through the national scholarships abroad program, Becas Chile, which started in 2008, complementing the program for national scholarships, begun in the early 1980s. From 2008 to 2017, Becas Chile awarded more than 3,770 fellowships to pursue doctoral programs abroad. The program has maintained an average of 377 scholarships per year to pursue a PhD abroad, which represent around 40% of the 740 scholarships for national doctoral programs allocated every year.

In sum, currently some 1,100 doctoral scholarships are granted every year. Graduation rate for beneficiaries of all scholarship programs oscillates between 75% and 90%, depending on the cohort (Dirección de Presupuestos 2017, 21, 25). Another official source puts the graduation rate at 77% over 10 years on average across scholarship programs and cohorts (CONICYT, 2018, 1). Time to degree was calculated at 6 years for those studying in Chile, and 7 years for Chileans abroad (Dirección de Presupuestos 2017, 25). By one estimate, these figures translate into 1,000 doctoral graduates per year, in Chile and by Chileans abroad (CONICYT 2018, 3). This is the flow. What is the aggregate stock of Ph.D. holders graduated since 1988, aided by all scholarships programs? Santelices and Bouchon (2018) put the figure at 9,500, including those still in process.

What are the employment perspectives of these doctors? According to Chile's Ministry of Economy, from 75% to 80% of doctoral graduates are employed in universities (MINECON 2016). More fine-grained data for graduates of national programs suggest that 70% of the

graduates from 2007 to 2014 were employed in Chilean universities in 2015. The majority of the rest were working as postdoctoral researchers through government-funded programs, while some 10% were either in business or government. Unemployment was estimated at 6% (CONICYT, 2018, 5).

In spite of the scholarship programs developed by the government since 2008, the rate of research and development personnel per one thousand people in Chile (less than 1) remains much lower than the OECD average of 7.6 (Comisión 2015, 32). This figure underscores the gap that needs to be overcome, and the limits to a strategy of outsourcing doctoral training to universities abroad (Pedraja-Rejas, Rodríguez-Ponce, and Araneda-Guirriman 2016).

Similar to international trends, the development of doctoral programs by discipline is not homogeneous: there is a preponderance of science programs, representing 33% of programs, followed by social sciences, economics and law (18%) and engineering, construction and industry with (17%). On the contrary, the disciplines with the fewest programs are services (0.3%), agriculture (6.3%) and education (6.9%). Programs in engineering, construction and industry almost doubled between 2010 and 2017.

While women's participation has grown between 2007 and 2017, the gap between men and women still persists. The major gender gap can be found in engineering, construction and industry, where women reached just 26% of enrollments in 2007 and 31% in 2017. The second area of knowledge where women have a low representation is in science, the area of knowledge that also concentrates the largest share of enrollments, and where the gender gap has become bigger. In 2007, women represented 43% of students in science doctoral programs, and in 2017, just 40%.

Following the availability of programs, enrollments are unevenly distributed across fields. In 2017 the percentage of students enrolled in basic sciences was 38.5%, followed by technology with 15% of enrollments. In disciplines such as arts and architecture the percentage of enrollments in reached 1.7%, and in business, 1.4%.

Challenges

There have been in the last decade a number of strategies from the government to directly or indirectly promote or strengthen doctoral programs in Chile and doctoral education generally.

This is appropriate, given the shortage of research personnel in the country generally, and in universities in particular. If all full-time equivalent faculty without a doctorate in Chilean universities were to be replaced by Ph.D. holders, close to 24,000 FTE positions would need to be filled.

Other indicators also underscore Chile's deficits. In 2017 Chile had 587 doctors per million inhabitants. The (2009) figure for the United States was 2,300, 1,800 in Spain, 4,400 in Germany, and 18,500 in Switzerland (Dirección de Presupuestos 2017, 14). While across the whole population in Chile 0.2% earned a Ph.D., the OECD average is 1.5% (Dirección de Presupuestos 2017, 18)

In spite of the enormous need for more people trained at the doctoral level in Chile, the budget for scholarships has decreased 15% in the National Program, and 19% in the Becas Chile program for study abroad, from 2013 to 2017 (CONICYT 2018, 18).

As indicated previously, the labor market for new doctors in Chile is scarce outside of the academic sector. Gonzalez and Jiménez (2014) point out that by 2018, the number of researchers with Ph.D. in Chile would have doubled compared to 2013 stock, but the national system for research and innovation lacks the capacity to absorb these new researchers for want of policies specifically targeted to absorption, and the dependency of universities from state funds to finance research, in the context of stagnant funding for research since 2010, which keeps investment in R&D stuck at 0.35 to 0.38% of GDP, compared to the OECD average of 2,4%.

For the past 20 years, the funding for new academic positions in universities has been made possible through enrollment growth. Alas, the past two years have seen an enrollments plateau, caused by a demographic shrink in the college age population, and a leveling off of student aid. As a result of these trends, universities are not expanding their faculty numbers, limiting the opportunities of new doctors to insert themselves in a tenure track position.

In fact, the expansion of available scholarships, both for programs in Chile and abroad, is often criticized for not having considered the demands on the higher education system of greater numbers of Ph.D. graduates.

So far the policy responses to this stalemate have been two-fold: fund adjunct, non-tenure track temporary positions for research staff, by requiring government funded centers and large projects to hire non-tenure track researchers, and provide state-funded incentives for voluntary retirement of senior faculty in public universities. It remains to be seen if this two-pronged approach will suffice to secure jobs for some 1,000 new PhDs graduating each year, considering that the private sector and the government are not so far major employers of doctors.

The difficulties already mentioned in procuring academic jobs for graduates is stimulating Chilean universities to rethink the purposes and curriculum of their doctoral programs. Albeit incipient, there is discussion (Santelices and Bouchon, 2018) about preparing students for a job market beyond academia, along the lines of the third mission. Skills often mentioned that respond to this profile are oral and written communication skills, teaching abilities, project writing and administration, learning about intellectual property and technological transfer, acquiring tools for business development and entrepreneurship, and improving English as a second language.

This is taking place in the context of insufficient policy development of a comprehensive national strategy for research, development and innovation involving government, industry, and universities. The current mismatch between advanced human capital formation and the generation of capacities to fruitfully employ those resources is a consequence of this lack of vision and planning. Hopefully the recent creation of the Ministry of Science and Technology, which strengthens the institutional side of the equation, will also serve to give prominence and better coordination to R&D policies to put Chile more completely in the information and knowledge society.

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