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Innovation for Social Inclusion

The Role of Researchers in the Global South

by

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Abstract

Knowledge inequalities persist between the Global North and the Global South, but also within countries between privileged and underprivileged segments of society. The purpose of this study is to understand the motives of researchers from basic science and technology to investigate on socially demanded issues as well as the obstacles they encounter. The study is based on the experiences from eleven research projects financed by the fund *Research and Innovation for Social Inclusion* at Uruguay's public university between 2008 and 2019. Motivational factors for engaging in the programme include being convinced of the social responsibility of research, scientific curiosity, relating to a problem personally as well as more practical considerations. Obstacles are the scholars' lacking awareness of what their own expertise can contribute, additional efforts in interacting with non-academic stakeholders, and a comparatively lower academic valuation of this type of research. Findings are interesting to policy makers and university responsibles who aim for human sustainable development, in the Global North and South alike.

Keywords: knowledge inequality, human sustainable development, inclusive innovations

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1 Introduction

Inequalities between the Global North and South persist in many areas and are often reinforced by the structures of disparity. This is particularly obvious in the fields of science and technology. While the capacity to generate and exploit novel scientific knowledge is seen as a key instrument for economic and social development, this capacity appears unequally distributed and largely concentrated in the Global North. Today's world is characterised by an acceleration of innovation and growing economic importance of knowledge. Moreover, there is a big social polarisation incorporated in both of these developments (Arocena & Sutz, 2003). The preceding globalisation implicates that knowledge asymmetries could become even more obvious because essential resources are available to comparatively wide groups in the North and comparatively narrow groups in the South (Arocena, Göransson & Sutz, 2018).

1.1 Inequality and Innovation

In most countries – both of the Global North and South – the gap between the top and the bottom of the income distribution is currently enlarging; implying that neither old nor new prosperity is broadly shared among the populations (Alvaredo, Chancel, Piketty, Saez & Zucman, 2018; Cozzens & Kaplinsky, 2009). As a consequence, many emerging economies including India and China have declared to shift their focus from unconditional economic growth to inclusive growth which implies enlarging the group of beneficiaries (George, McGahan & Prabhu, 2012). This is understood as necessary because the rapid economic growth of the past has provoked severe ecological damage and rising social inequality (Arocena, Göransson & Sutz, 2018).

As a consequence, researchers increasingly find that measuring development merely in economic terms and implying that growth is necessary at all stages does not provide reasonable incentives to promote the quality of life of people (Arocena, Göransson & Sutz, 2018). Instead, definitions of human development stress the importance for people to expand their freedoms and capabilities to lead lives they value (Sen, 2000). Additionally, aspects of environmental sustainability need to be included in order to account for intergenerational justice and planetary boundaries (Arocena, Göransson & Sutz, 2018). Consequently, the notion of *human sustainable development* rather than that of economic growth defines the future prospects to be aimed for in this study.

The relationship between innovation and inequality is manifold and multi-directional. On the one hand, Moulaert and MacCallum (2019) see inequity, marginalisation and exclusion as the negative consequences of growth-oriented innovation. That is because market demands incentivise the spending of public and private resources on consumer demands rather than on

social needs (Mulgan, Tucker, Alli & Sanders, 2006). This results in a discrepancy between meeting the demands of high and middle-income groups as opposed to low-income groups. A particularly obvious example is health research where only about 10% of worldwide resources are dedicated to diseases which typically affect 90% of the world population, while the health problems of the remaining 10% are covered by 90% of research efforts (Alzugaray, Bianco, Goñi, Mederos, Sutz & Robaina, 2014). On the other hand, innovation including scientific research also bears great potential to promote social and economic development (Mormina, 2019). Also the national innovation systems (NIS) approach understands a country's capacity to promote interactive learning as a key, not only to stimulate growth but to achieve inclusive and environmentally sustainable development (Chaminade, Lundvall & Haneef, 2018).

One of the means to counteract growing inequalities is through *social innovation*. According to the Bureau of European Policy Advisors, social innovations need to be social in their ends as well as in their means; thus they provide a tool to empower people and transform society (BEPA, 2010). Moulaert and MacCallum (2019) define the three core principles of social innovation to be that they (i) meet needs neglected by markets and states, (ii) create new forms of relations and (iii) empower people, most importantly the marginalised. As such, social innovation is often understood as a reaction to the withdrawal or deficiencies of the welfare state (Avelino, Wittmayer, Pel, Weaver, Dumitru, Haxeltine, Kemp, Jørgensen, Bauler, Ruijsink & O'Riordan, 2019). Increasingly diverse actors, for instance, from governments, business, civil society, and academia engage in social innovation (Edwards-Schachter & Wallace, 2017). In this study, the focus will be placed on the role of universities.

1.2 Research for Social Inclusion

Universities are a central actor of knowledge creation and diffusion in national innovation systems. They contribute to human sustainable development through research and the education of skilled workforces (Brundenius, Lundvall & Sutz, 2009). From the perspective of university research, innovation is defined by the goals of improving the understanding of processes and advancing in knowledge, whereas from a commercial perspective, an innovation is determined by market success and diffusion rather than just by its originality (Reddy, 2011).

To counteract enlarging knowledge inequalities, the concept of *developmental universities* has been introduced in Uruguay, among other countries. These contribute to human sustainable development by democratising the access to higher education, researching on socially demanded issues, and cooperating with a wider range of actors to solve problems (Arocena, Göransson & Sutz, 2018). As a part of its strategy, in 2008 Uruguay's only public university (Universidad de la República, UdelaR) installed the competitive research fund *Research and Innovation for Social Inclusion* with the aim to align research efforts and social demands (Sutz, Tomassini, Zeballos, Goñi & Rodales, 2019). Essential stages of the financed research projects include (i) recognising an unmet social demand, (ii) establishing linkages between relevant academic and non-academic stakeholders, (iii) translating the social demand into a research problem, (iv) evaluating its academic quality and (v) promoting the implementation

for likely users (Sutz et al. 2019). Thus, the programme complies with Moulaert and MacCallum's (2019) requirements of a social innovation: it fills a gap left by the market, establishes new linkages between different actors of society, and empowers marginalised groups, by addressing them as users or even including them in the innovation process.

Accordingly, researchers can play a crucial role in contributing to human sustainable development in their countries, for instance, by setting their research agendas. This is relevant both in the Global North and in the Global South because sustainable development is not a static point to be reached but rather a continuous process (Arocena, Göransson & Sutz, 2018). In more economically developed countries, the lion's share of research and development (R&D) is financed by the private sector, whereas in less economically developed countries the government sector including public universities is the most important source to fund research (Brundenius & Göransson, 2011). Consequently, public universities and their researchers are decisive actors in the innovation systems of the Global South.

1.3 Aim and Scope of the Study

The purpose of this study is to understand the role of university research in human sustainable development in the Global South by analysing the case of researchers innovating for social inclusion at Uruguay's public university. Specifically, the study focuses on researchers from the fields of technology and basic science who participated in the programme *Research and Innovation for Social Inclusion* between 2008 and 2019. Years of experience from the programme have shown that academics from these fields are generally less prone to participate in projects directed at social inclusion (Unidad Académica, 2020). Moreover, there is a significant gap between the applications to funding with an open research agenda as opposed to the programme specifically addressing social problems, even though subsidisation is the same (Tomassini, 2019). Accordingly, the study aims to find answers to these open questions by understanding the motivation, obstacles, and experiences of scholars in researching to solve problems of social inclusion.

1.4 Outline of the Study

The remainder of the study is structured as follows. The second chapter sheds more light on the theoretical background of national innovation systems in the Latin American context, focusing on the role of universities and researchers in particular. Also the research questions derived from the theory are presented. In the third chapter, the methods of data assessment and analysis are described. The fourth chapter contains the analysis and discussion of results. Ultimately, the fifth chapter provides a summary of the study as well as practical implications and indication for future research.

2 Theory

In the following chapter, the theoretical background is set to provide the context for this study. While the specific unit of examination is university research in Uruguay, many of the typical characteristics of its national innovation system and university structure apply to more Latin American countries, especially in contrast to those of the Global North. Inequality in Latin America appears to be persistent, structural, and difficult to mitigate with any kind of development strategy (Sutz, 2003). Despite obvious differences between the countries of Latin America, for example in terms of size and demography, they share many common features and trends (Arocena & Sutz, 2001) which is why it is partially referred to Latin America as a whole. Besides its relatively small population of 3.3 million inhabitants, Uruguay sticks out from its South American neighbours for the comparatively low inequality and high political stability (Arocena & Sutz, 2011). Before 1960 and after the end of the dictatorship in 1985, Uruguay has been considered a model country in Latin America in terms of defining the economic and social role of the state (Arocena & Sutz, 2011).

2.1 Previous Research

This chapter is structured from the general to the specific; addressing the characteristics of Latin American NIS, the particular role of universities within these, the programme for social inclusion at Uruguay's public university, and ultimately, the role of individual researchers.

2.1.1 National Innovation Systems in Latin America

The national innovation systems approach has established as one of the main theories in explaining the innovative capacity of countries. It is built on the assumption that innovation is a learning process involving a range of actors and their interaction to form a complex and dynamic system (Chaminade, Lundvall & Haneef, 2018). One of the novelties the NIS approach brought was that innovation does not merely originate from science but can also be the outcome of experience-based learning in the productive sector (Chaminade, Lundvall & Haneef, 2018). However, the concept has been viewed as limited in its applicability to the Global South whose countries typically rely more on learning in the sense of absorbing as opposed to generating novel knowledge (Arocena & Sutz, 2000). Arocena and Sutz (2000) note that as the NIS model has been developed based on the experiences of industrialised countries, it rather serves as an ex-ante concept for many economies of the South. For instance, many countries in Latin America did not take part in the historical period of fast industrialisation and thus lack important structures of NIS (Arocena & Sutz, 2000).

There is an important distinction between the narrow understanding of NIS which is merely based on the interaction of firms and research institutions, while the broad definition also incorporates user-producer interaction, national institutions, and organisations in the "social learning process" (Chaminade, Lundvall & Haneef, 2018, p. 8). Chaminade, Lundvall and Haneef (2018) state that the broader and revised NIS approach acknowledges the diversity of learning paths, as well as variation in social and economic structures. This is particularly important in applying the NSI concept to the Latin American context where most of the innovative activity takes place in the agricultural sector rather than in industrial production (Arocena & Sutz, 2000). The economies largely rely on the export of commodities that do not require much value-adding in terms of knowledge (Sutz, 2003).

Besides the underdevelopment of the industrial sector, also the relative isolation of the university distinguishes many Latin American innovation systems from those typical of the Global North (Arocena & Sutz, 2001). In Latin American NIS, the university often remains isolated and a "lonely" actor, particularly concerning the creation of new knowledge (Arocena & Sutz, 2001, p. 1229). In this context, it is important to consider that university research plays a more decisive role in the NIS of the South, like in Brazil or Uruguay, compared to the industrialised countries where the lion's share of R&D is carried out and financed by the private sector (Brundenius & Göransson, 2011). Moreover, when universities cooperated with the productive sector in the past, this was mainly to consult the usage of existing knowledge rather than for the creation of new knowledge (Arocena & Sutz, 2003). According to Arocena and Sutz (2000), science, technology, and innovation have rarely been prioritised in Latin American political agendas. Endogenously produced knowledge is generally not attributed a high value (Sutz, 2003). More recently, however, joint research efforts of the university and the productive sector have been fostered in Uruguay (Arocena & Sutz, 2011). While in the past, public policies attempting to promote links between university and industry were weak or non-existent, now certain institutions such as technology incubators have been installed (Reddy, 2011).

Well-functioning national systems of innovation are required in Latin America not only to produce but also to effectively diffuse technical solutions to problems of inequality (Sutz, 2003). However, an important consideration of the NIS approach is the high context specificity which indicates that best practices cannot simply be replicated in other settings (Chaminade, Lundvall & Haneef, 2018). This implies that successful models from the Global North cannot simply be applied to the innovation systems of the South; however, as an ex-ante concept they might be an "object of policy" (Arocena & Sutz, 2000, p. 59).

2.1.2 Latin American Universities

Since universities represent important actors in every national innovation system, but even more so in Latin America, more light will be shed on their role in the creation of new knowledge. Figure 1 depicts the share of universities in total R&D spending at four levels of absolute university R&D expenditures per capita in selected countries (Brundenius & Göransson, 2011). In Uruguay, the level of university spending on R&D per capita lies between 11 and 29 PPP$ which is classified as medium low. At the same time, this constitutes a relatively high share of 37% of total R&D expenditures. In contrast, in Sweden university

spending on R&D per capita is more than 100 PPP$ while universities contribute merely 21% of total R&D spending. These numbers illustrate the low overall level of R&D spending in Uruguay as opposed to more economically developed countries and the important role of universities in view of scarce private investment in R&D.

	Share of university R&D in total R&D spending		
University R&D per capita (PPP$)	Relatively high (more than 30%)	Medium (15-30%)	Low (less than 15%)
High (more than 100 PPP/capita)		Denmark (28%) Sweden (21%) Germany (16%)	United States (13%)
Medium high (30-74 PPP/capita)	Latvia (43%) Brazil (38%)		
Medium low (11-29 PPP/capita)	Cuba (50%) Uruguay (37%)	South Africa (19%)	Russia (6%)
Low (less than 11 PPP/capita)	Tanzania (53%)	Vietnam (18%)	China (9%)

Figure 1: Absolute and relative size of university R&D – around 2007, Brundenius & Göransson (2011), p. 344

While some researchers claim that scientific progress in itself is socially useful and contributes to development, others emphasise a special responsibility of academia to focus on issues of inequality and development (Arocena & Sutz, 2003). Latin American universities had hardly been involved with social problems before the 1918 student rebellion at the University of Córdoba in Argentina and the subsequent University Reform Movement (URM) which spread across the entire continent (Arocena & Sutz, 2005). The URM demanded the democratisation of universities not only in the sense of providing tuition-free third level education to a larger share of the population, but also by allowing students to co-govern universities (Arocena & Sutz, 2005). One of the main claims of the URM was to establish *university extension*, so the connection of universities with disadvantaged sectors of the population as the third pillar alongside the Humboldtian missions of teaching and research (Arocena & Sutz, 2005). The objective of university extension is bringing knowledge closer to people in an ongoing collective progress towards more equality (Arocena & Sutz, 2011). This mission has been described as the "anchor to the earth" of Latin American universities which keeps them connected to the surrounding reality (Arocena, Bortagaray & Sutz, 2008, p. 192).

This anchor is particularly relevant in the light of the prevailing blame of Latin American universities to be "ivorytowerist" (Arocena & Sutz, 2001, p. 1228). They are criticised for

following highly internationalised research agendas while allegedly not solving the local problems (Arocena & Sutz, 2001). Being rather isolated within the domestic innovation system, the Latin American research community is strongly connected on the international level (Sutz, 2003) and foreign funding, for example, from the Global North represents a relevant source for financing research projects (Arocena & Sutz, 2001). Contradictorily, universities are criticised for not approaching the local problems, while academics have described "a lack of social demand for endogenously generated knowledge" in Uruguay (Brundenius & Göransson, 2011, p. 348).

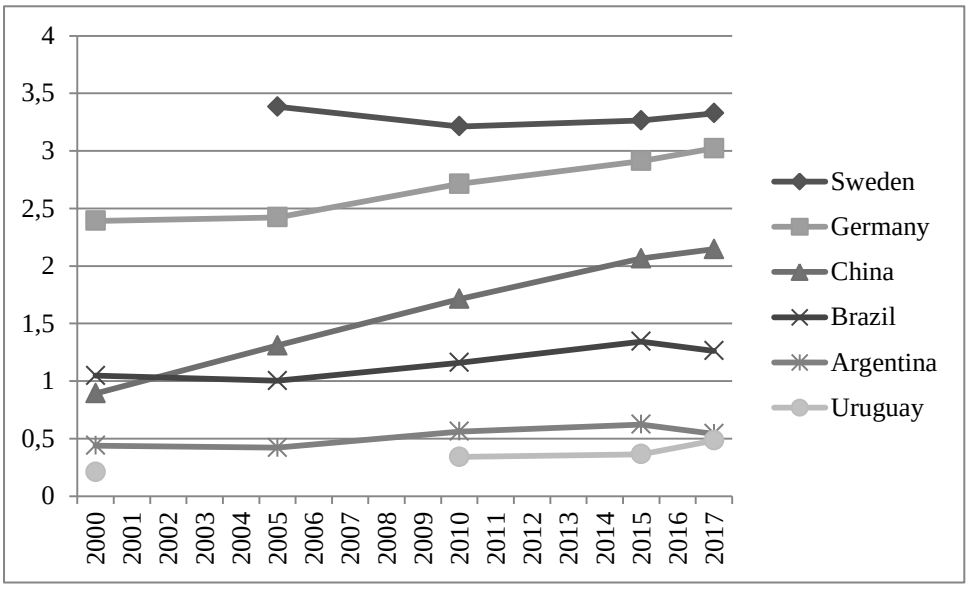

Figure 2: Research and Development Expenditure (% of GDP) for selected countries, 2000 - 2017, own presentation based on World Bank (2020)

A common problem in the Latin American university systems is the scarcity of financial resources. As can be seen from figure 2, in Brazil, Argentina, and Uruguay a considerably smaller share of the GDP is devoted to R&D activities than in newly industrialised China or economies of the Global North like Germany or Sweden. Although steadily growing, expenditure in research in Uruguay lies only at 0.5% in 2017 and thus remains low, also in comparison to neighbouring Brazil. In Uruguay, the underfinanced research system is the cause for many subsequent problems such as the continuous brain drain (Arocena & Sutz, 2000). Salaries at the university remain comparatively low and highly educated professionals often do not find employment in the national firms because the demand for university-trained personal is low (Arocena & Sutz, 2011). Money is increasingly sourced externally, for instance, from the Uruguayan productive sector, international loans, or research agencies in the Global North (Arocena & Sutz, 2001). Critics warn that financial rewards based on specific research results will bias scholars in their research agendas towards market demands which are not necessarily congruent with social demands (Reddy, 2011; Arocena, Göransson & Sutz, 2015). Worldwide, universities are occupied with the increasing importance of external relations; however, Latin America universities face a particular tension between the social mission of the URM tradition and the new, market-like relations with governments and entrepreneurs (Arocena & Sutz, 2005).

2.1.3 Innovation and Research for Social Inclusion

As many countries of the Global South have declared to promote inclusive growth, the term *inclusive innovation* has recently gained attention (George, McGahan & Prabhu, 2012). According to George, McGahan and Prabhu (2012), the concept refers to "the development and implementation of new ideas which aspire to create opportunities that enhance the social and economic well-being for disenfranchised members of society" (p. 663). Certain groups can be excluded from society because of vertical and horizontal inequalities. On the one hand, vertical inequality refers to the difference in economic status which causes people to be marginalised in society because of their relative economic poverty (Trojer, Rydhagen & Kjellqvist, 2014). On the other hand, horizontal inequality refers to disadvantage based on geographical location, gender, disability, or ethnicity (Trojer, Rydhagen & Kjellqvist, 2014). Inclusive innovations can be technological innovations in products, processes, or services that address such problems; moreover, they potentially enable social and institutional innovation (Chaminade, Lundvall & Haneef, 2018). Accordingly, Chaminade, Lundvall and Haneef (2018) understand it as a major challenge for policy makers in countries at all stages of development to build inclusive innovation systems which ensure that science and technology not only benefit privileged individuals but society as a whole.

As a means to comply with the social commitment of public research institutions, the concept of *developmental universities* has gained popularity. Among other things, it implies to incorporate issues of inequality in research agendas (Arocena, Göransson & Sutz, 2015). There is the wide-spread assertion that the contribution of researchers will be socially useful regardless of what they investigate on, indicating that there is no need to "impose" a particular agenda (Arocena & Sutz, 2003, p. 83). However, according to Arocena and Sutz (2003), there are important reasons for public intervention in matters of innovation, for instance, the underinvestment in research, the dispersion of capacities, and the need for stimulation in the sphere of social problems. Moreover, Sutz (2003) emphasises that the main problem is the lack of technical solutions to problems of poverty; and not merely the lack of implementation.

Since 2008, the funding programme *Research and Innovation for Social Inclusion* has been established on a regular basis by the Academic Unit of the University Research Council (Comisión Sectorial de Investigación Científica, CSIC) of the public university in Uruguay (Alzugaray et al. 2014). The financial resources provided by the fund can be allocated to salaries of researchers, expenses for equipment, and other investments on the basis of the project's objectives (CSIC, 2014). The programme is based on the conviction that placing unnoticed or underfinanced problems on the research agenda will increase their chances of being solved (Alzugaray et al. 2014). Consequently, the idea is to invoke the creativity of the academic community in considering cases of social emergencies and inequality in research (Alzugaray et al. 2014). In its more than ten years of realisation, the programme has financed 87 projects in areas as diverse as disability, health, nutrition, housing, gender, and territorial inequality (Sutz et al. 2019). To be eligible for the programme, the research project needs to be aimed at solving a problem of social inclusion and do so explicitly through the creation of new knowledge or the alteration of an existing innovation (CSIC, 2018). Thus, the programme explicitly complies with the university mission of research, not extension. In anchoring issues of inequality in the research agendas, Sutz (2003) considers it crucial to combine social relevance and research excellence. The evaluation of the proposals is equally

based on their academic quality and the dimension and clarity of the social problem which is supposed to be approached with their help (CSIC, 2018). The financed projects have to be developed in a period of eighteen to twenty-four months (CSIC, 2014).

Since social demands to be solved with research can be difficult to identify, a second modality has been incorporated in the programme from 2010 onwards (Alzugaray et al. 2014). It provides funding for researchers whose disciplines are not directly linked to social problems, to detect innovation demands, include these in their research agendas, and to prepare for the actual research project (Alzugaray et al. 2014). Projects of the second modality usually receive support for a shorter period of six to nine months and are understood as the pre-phase of the first modality which allows the projects to be realised (CSIC, 2018).

As can be seen from figure 3, there is a clear imbalance between disciplines in the research projects (both modalities) financed by the programme *Research and Innovation for Social Inclusion* (Unidad Académica, 2020). While the vast majority of projects in every year is linked to social science, projects from the fields of agrarian or basic science only appear sporadically. The number of technology-related projects has been evolving between zero and three per year. There have been three to five projects aimed at solving the problems of health of a deprived group. Importantly, as teams are often multidisciplinary, technological researcher or basic scientists might also be involved with projects categorised as health outcomes, for instance.

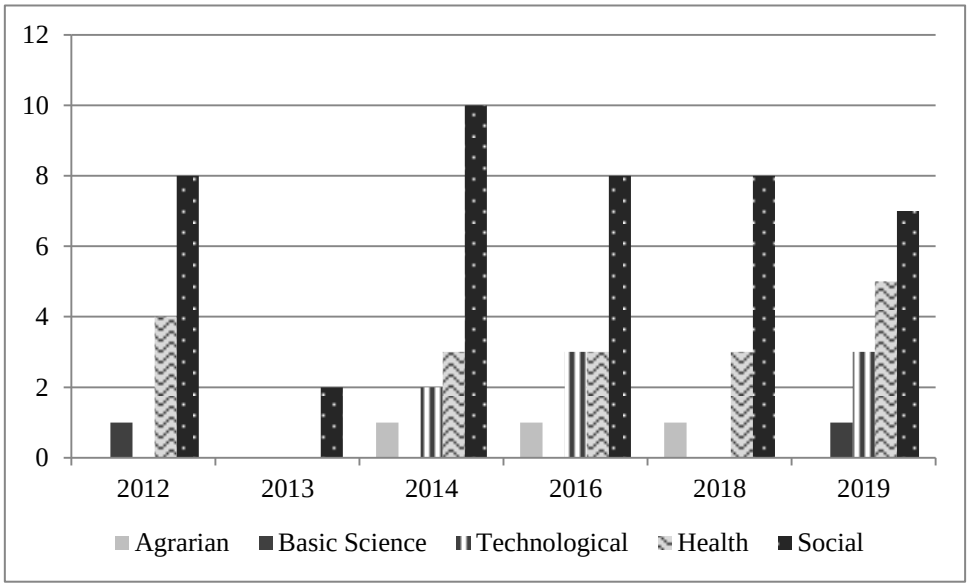

Figure 3: Projects financed by the program *Research and Innovation for Social Inclusion* by area, 2012 – 2019, own presentation based on Unidad Académica (2020)

The discrepancy becomes even more obvious when looking at the number of applications per year (Unidad Académica, 2020), as displayed in figure 4. Applications in the fields of social science and health are considerably higher in quantity than all other areas. However, there is a certain variance in the composition of applications which is due to specific foci of the years.

For example, the 2019 call for applications was specifically aimed at knowledge demands of the Uruguayan care system (Sistema Nacional Integrado de Cuidados), explaining the dominance of projects directed at health issues in that year (CSIC, 2019).

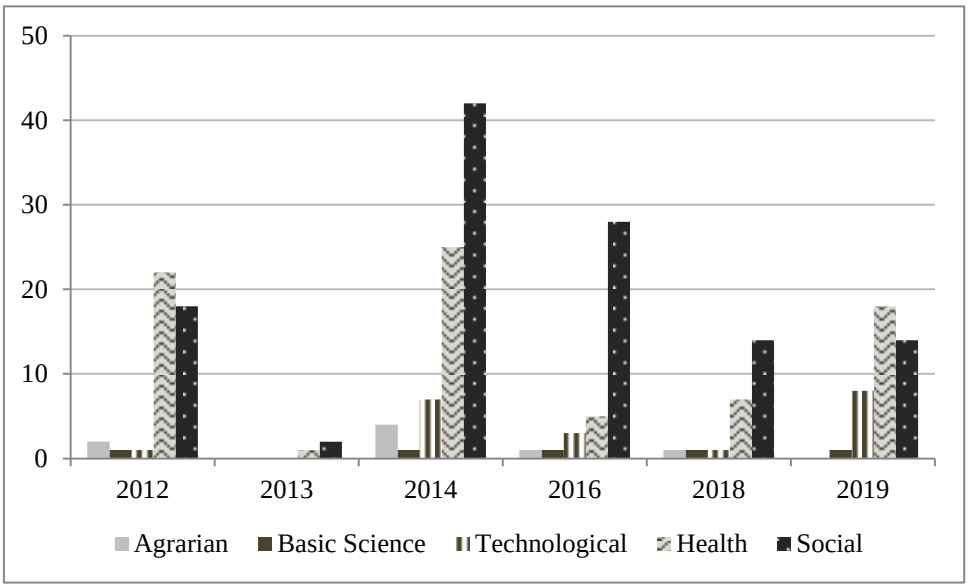

Figure 4: Applications to the program *Research and Innovation for Social Inclusion* by area, 2012 – 2019, own presentation based on Unidad Académica (2020)

Between the years 2012 and 2019, a total of 230 applications has been made to the fund, out of which 74, so roughly every third has been approved (Unidad Académica, 2020). Compared to other sources of funding, this constitutes a high chance of acceptance. For instance, 19% of

applications in the field of development research[1] have been approved by the Swedish Research Council in 2019 (Swedish Research Council, 2020). So, why are there comparatively few applications to the fund *Research and Innovation for Social Inclusion*, especially from the fields of basic science and technology? To approach these questions, the role of researchers participating in research for social inclusion will be examined further.

2.1.4 The Role of Researchers

D'Este, Llopis and Yegros (2013) examine which cognitive and motivational factors increase the likelihood of researchers to adopt practices of co-producing knowledge with non-academic actors. They find that placing social relevance as a critical research goal, which they define as prosocial research, tends to be associated with engaging in knowledge transfers with other parts of society (D'Este, Llopis & Yegros, 2013). Accordingly, assigning a social responsibility to research could be an antecedent of innovating for social inclusion.

Apart from the motivational factors, practical considerations also play an important role. Finding solutions for problems of social inclusion in the context of underdevelopment is shaped by the conditions of shortage in many aspects (Alzugaray et al. 2014). From the experience of the programme *Research and Innovation for Social Inclusion*, investigating a socially demanded issue can be very different from typical academic projects with an open agenda. Alzugaray et al. (2014) have described a higher complexity of the research problems which results from their long-term nature, the multitude of variables to be considered, and uncertain results. Furthermore, working in new fields, coordinating and communicating in multidisciplinary teams as well as with actors from outside academia may cause obstacles (Alzugaray et al. 2014).

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[1] Development Research is defined by the aims of fighting poverty and promoting sustainable development (Swedish Research Council, 2019).

Furthermore, social commitments of researchers can be perceived as conflicting with advancing a career in research (Sutz, 2003). The academic community is facing pressure to publish in order to reach scarce academic positions and receive the necessary grants (Arocena & Sutz, 2003). Moreover, the academic reward system presumes publishing in international refereed journals as a main indicator of academic quality (Arocena & Sutz, 2011). For some scholars, this could be a hindrance in investigating a socially demanded issue which might be primarily of national interest and more uncertain with respect to outcomes (Alzugaray et al. 2014).

Once a research project is successfully accomplished and, for instance, a technical solution has been invented, the social problem is not automatically solved (Sutz, 2003). For example, the implementation of results often depends on manufacturing a prototype in high volumes which the university itself is not capable of and frequently lacks partners for in an underdeveloped NIS (Sutz, 2003). Sutz (2003) describes that researchers who put effort in innovating for social purposes not infrequently end up frustrated when the solutions they found cannot be applied, for example, because social actors lack the power to implement them.

At the same time, however, researchers participating in the programme have emphasised the enriching experience of exchange with non-academic counterparts and the benefits of using creativity to break up research routines (Alzugaray et al. 2014).

To sum up, in section 2.1 previous theoretical findings have been presented with respect to the distinctiveness of Latin American systems of innovation and the role of universities. Furthermore, the fund *Research and Innovation for Social Inclusion* at Uruguay's public university and its open issues have been introduced. Ultimately, theoretical observations concerning the experiences of researchers who worked on problems of social inclusion have been summarised.

2.2 Research Questions

In this study, the above findings from previous research will be examined following a deductive approach. Based on the case of researchers who have led projects in the programme *Research and Innovation for Social Inclusion* at Universidad de la República between 2008 and 2019, the study aims to answer the following question.

RQ: What are the motives and obstacles for researchers from the fields of technology and basic science to investigate socially demanded issues?

Furthermore, in order to narrow the focus and specify the most relevant aspects of the research question, the following subquestions will be addressed.

SQ1: How do researchers from the fields of technology and basic science perceive their role in the context of Latin American innovation systems?

SQ2: How do researchers from the fields of technology and basic science perceive the social responsibility of their work?

SQ3: From the researchers' perspective, how does the research oriented at social inclusion differ from more classic projects with an open agenda?

SQ4: Which obstacles and inconveniences on the one hand and benefits and rewards on the other hand did the researchers face while investigating a socially demanded issue?

SQ5: How is the impact of their projects evaluated by researchers from the fields of technology and basic science?

In the following chapter, the methodological approach chosen to answer these questions will be presented.

3 Methodology

In this chapter, the methods employed to approach the aim of the study and answer the research questions are described. Firstly, the motivation behind the qualitative research approach is explained. Furthermore, the research design, the methods of data collection and analysis are presented in detail. For each of the points, limitations are considered. Ultimately, the chapter is summarised and critically discussed with respect to a potential generalisation from the study.

3.1 Research Approach

In answering the research questions that target the motivation and obstacles of researchers participating in the programme, a qualitative approach appears most suitable. Ritchie et al. (2003) summarise that qualitative research is generally seen as a naturalistic and interpretative method to assess a group's understanding of a certain social phenomenon. It is based on the assumption that reality is perceived through the lens of the individual rather than existing as an objective truth which constitutes a major difference between social and natural sciences (Ritchie et al. 2003). Consequently, the researcher is the most important tool in qualitative research which implies that reality is always constructed through the researcher's perception and shaped by prior knowledge (Ritchie et al. 2003).

The study is rather deductive in nature which indicates that evidence is used in support of conclusions, although it is not strictly deductive in the sense of hypothesis-testing (Ritchie et al. 2003). On the other hand, an inductive research approach would mean the completely open and unprejudiced exploration of a field which might result in building theory from case studies (Eisenhardt, 1989). However, in this case the researcher has predefined ideas derived from the literature study which will naturally influence how observations are interpreted (Flick, 2009). Unless the researcher is aware, this could provoke confirmation bias when the predefined theories are sought to be verified rather than falsified (Flick, 2009).

To counteract the common criticism of subjectivity in qualitative research and ensure the reliability and validity of the study, certain measures will be taken. Although it is not as straightforward as in quantitative research, reliability in qualitative research can be attained by documenting each step of the study carefully and comprehensibly for others (Flick, 2009). This will be done in sections 3.3 and 3.4. Also in terms of validity, Flick (2009) insists on transparency and consistency in the procedure as these are crucial factors for making the researcher's construction of reality traceable to readers. This includes the stages of research design as well as the data collection and the interpretation of results (Flick, 2009).

3.2 Research Design

Social innovations are highly specific to their respective geographical, socio-political, and institutional contexts which is why they cannot be separated from the problems they aim to solve (Moulaert & MacCallum, 2019). Accordingly, a case study design represents an adequate method to assess and display the complexity and individuality of one particular setting in great detail (Eisenhardt, 1989). This study is going to be based on the specific case of the programme *Research and Innovation for Social Inclusion* at Uruguay's public university and the experience of technology and basic science researchers who have participated. In contrast to cross-case analyses, case studies of only one incident allow for the most detailed examination, whereas they do not provide a basis for comparisons or generalisation beyond the specific context according to Creswell (2014) and Eisenhardt (1989). However, Ritchie et al. (2003) distinguish theoretical generalisation in the sense of theory building and empirical generalisation in the sense of (i) transferring from the research sample to the parent population or (ii) inferring to other settings beyond the one which has been studied. While the derivation of theories and universal implications for social policy is not possible on the basis of this case study, the two types of empirical generalisation might be valid under certain circumstances (Ritchie et al. 2003) and will be discussed in the summary of the methods chapter.

3.3 Data Collection Method

Case study design requires data collection from multiple sources and is ideally complemented with both, qualitative and quantitative sources of data (Creswell, 2014). Different sources provide a broader perspective and ensure triangulation (Flick, 2009). The data collected for this study include interviews, written documents such as calls for research proposals, and descriptive statistics on the numbers of applicants and participants in the programme. While the latter two sources of information have been provided by the Research Council of UdelaR, the interviews have been specifically tailored and conducted for the purpose of the study.

The sample of study participants has been purposively limited to researchers from the fields of interest and modified for reasons of availability. This form of convenience sampling is a common practice in qualitative research (Ritchie et al. 2003). However, the sample can provide a nearly all-encompassing and thus representative picture as every project team of the programme involving at least one responsible researcher from the faculties of chemistry, natural science, engineering, or design, architecture and urbanisation have been approached with the help of the programme coordinator and all except one participated. This constitutes a sample of eleven research projects oriented towards social inclusion and a total of fifteen project responsibles participating in the interviews. Within the scope of this sample, project reports have been reviewed and included in the study. For the more recently initiated projects that have not yet been completed, the project plans have been used instead.

It is important to mention that the projects have mainly been examined from the researchers' perspectives. The perceptions of the involved non-academic counterparts and researchers from different disciplines (except in one case where the responsible medical researcher joined the interview) have been excluded because the scope of the study had been limited to the role of basic science and technology researchers. In addition, an expert interview has been conducted with Judith Sutz who coordinates the programme since it has been established on a regular basis from 2008. The interview was important to the study, not only because it gave an overview of the development of the programme, but also because it provided the valuation of someone who has been in exchange with participating researchers throughout the entire period. Moreover, the coordinator's point of view serves as a means of triangulation (Flick, 2009) as it provide another perspective on the statements of the researchers.

The semi-structured interviews have been conducted in English or Spanish language, depending on the interviewee's preference. The interviews have been based on the guide which can be reviewed in appendix A. In two cases, researchers from CSIC accompanied the interviews on the participants' request to assist with potential language difficulties. The interview guide has been designed on the basis of the antecedent literature study. This deductive approach bears the danger of not being explorative enough to bring up new topics but instead confirm preconceived ideas. On the other hand, in the view of time constraints it allowed to efficiently limit the scope of the study to the most essential aspects (Flick, 2009). To facilitate new ideas to come up, questions have been formulated open and non-suggestive and interviews have been closed with a query about topics which the interviewee felt had not been covered.

There has been one interview per research project; meaning that if two responsible researchers agreed to participate they had been interviewed simultaneously which gave them the possibility of interacting. As a consequence of the outbreak of the coronavirus and respective

travel and contact restrictions[2], two interviews had to be conducted as video calls and two researchers of one project preferred to answer the interview guide in written form. Apart from the latter, all interviews have been audio-recorded and lasted between twenty-one and a hundred minutes, due to the varying response behaviour of participants.

In conducting interviews, it becomes particularly obvious that the researcher is a key tool in qualitative research (Ritchie et al. 2003). The setting, the acting of the interviewer, and the recording can influence what an interviewee wants to share and the way in which he / she presents his / her experience (Flick, 2009). Again, it is important to acknowledge the potential bias and to create trust, for example, by agreeing on confidentiality and anonymity (Ritchie et al. 2003). Another way in which the presence of the researcher can bias an interviewee's replies is through the effect of social desirability (Flick, 2009). This is particularly relevant in the context of this study where it is asked for the motivation of academics to research on problems of social inclusion. For instance, they might overemphasise motives of social responsibility while in reality they applied because it is a comparatively less competitive source of funding. To avoid these types of bias, questions have been formulated as open as possible and also the order of questions has been set intentionally as recommended by Flick (2009). For example, it has been asked very generally about the role of the university in society before the attention has been drawn to the specific case of research for social inclusion. However, the bias has likely persisted as all participants had been informed about the topic of the interview beforehand. Furthermore, the contact to the interviewees has been established via CSIC, so potentially the interviewer has been perceived as being a part of their team. This and the presence of members of CSIC in two of the interviews could have caused participants to answer in an allegedly desired way.

Importantly, in conducting fieldwork, more information than what is said in interviews or written in reports can be absorbed by the researcher (Flick, 2009). For instance, working in

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[2] In-person interviews have not been possible from 16/03/2020 as the UdelaR strongly advised against meetings. Since the air traffic between Uruguay and Europe has been stopped for an undetermined period of time, the author of this thesis left Montevideo on 17/03/2020, before the planned end of the fieldwork.

the office of CSIC, a constant exchange with its employees enabled a better understanding of the problems faced in the programme for social inclusion and more profound knowledge about the approach. Notes have been taken in order to record relevant aspects mentioned in rather informal conversations. Once again, it needs to be considered that the researcher serves as an instrument to the study and that she is constantly taking or being assigned to certain active roles (Flick, 2009).

To sum up, data collection has been done acknowledging and wherever possible avoiding bias. However, it cannot be assumed that all sources of systematic errors have been eliminated. Yet, taking into account the subjectivity of individual perception, observations made in the process of data collection provide a valuable basis for the data analysis.

3.4 Data Analysis

As the next step, the interviews have been transcribed using a moderately precise style which allowed balancing detailedness on the one hand and time constraints on the other hand (Flick, 2009). Subsequently, the interview transcripts, the written interviews and relevant project proposals and reports have been uploaded to the Nvivo tool for qualitative data analysis. Based on the antecedent literature study, but also incorporating new ideas, a keyword list has been constructed. Furthermore, in coding the interviews and organising and subcategorising themes, the foundation for the consecutive analysis has been laid. This first step in the continuous process of data analysis can be roughly assigned to the management of data, while in the second stage, sense is made of the evidence through descriptive and explanatory accounts (Ritchie et al. 2003). The list of keywords used for the management of data in Nvivo can be reviewed in appendix B. The frequency of occurrence of the different aspects might provide indication of their relevance; however, it cannot serve as a basis to draw conclusions as the frequencies depend on the author's focus in interviews and interpretation in the analysis.

In this kind of qualitative data analysis, it is relevant to consider that the interpretation and categorisation of ideas is largely dependent on the creativity, conceptual thinking, and prior knowledge of the analyst (Ritchie et al. 2003). The preconceived theoretical constructs are derived from the literature and can be related to in the theory section of this study. The descriptive part of the analysis contained the detection of differences and similarities throughout the eleven research projects as well as the abstraction of ideas in superior categories (Ritchie et al. 2003). The subsequent phase of explanatory accounting involved finding linkages between the distinct phenomena, also at different levels of categories (Ritchie et al. 2003). For this study, the aspects listed in table 1 have been grouped according to the five subquestions which they aim to answer. Furthermore, additional statements relating to the main research question have been collected to add to the findings.

3.5 Chapter Summary and Discussion

In this chapter, it has been reasoned why a qualitative approach is appropriate to answer the research question about the motivation and obstacles of basic scientists and technology researchers to investigate problems of social inclusion, despite certain limitations and particularities of qualitative research. To ensure the reliability and validity of the study, all stages of the study including the research design, data collection, and data analysis have been stated in detail. Throughout all phases, it needs to be considered that reality is observed, abstracted, and described through the perception and thinking of the researcher. However, if this is taken into account, valid conclusions can be drawn for the specific context.

Furthermore, using case study design entails that a group of Uruguayan researchers cannot serve as a basis for universal theory building. Nonetheless, as a relevant share of all researchers from basic science and technology who lead research projects in CSIC's programme for social inclusion participated in this study, results can be applied to the entire group of researchers from these fields in Uruguay. This refers to the first type of empirical generalisation according to Ritchie et al. (2003) and allows drawing policy implications at this level, for example, by the programme responsibles. The second type of empirical generalisation implies that results found in one context can be inferred to another setting, if enough knowledge exists about both, the sending and the receiving contexts (Ritchie et al. 2003). Referring to this study, it could mean that conclusions drawn from the Uruguayan setting also apply to the situation in other Latin American countries, given that the contexts are sufficiently similar.

4 Analysis and Discussion

In this chapter, the findings of the study are presented, analysed, and discussed in relation to the theory. As the basis of the case study, all research projects included are displayed in table 1. The year in which the projects have been initiated as well as a short description of their objective is provided. As the projects have been initiated throughout the course of eleven years, it is important to state that they are at very different stages of development. Furthermore, the faculties of the project responsibles who have joined the interviews are specified. Importantly, many of the projects are multidisciplinary and involve more responsible researchers. However, for reasons of clearness and following the focus of the study on researchers from specific disciplines, not all of them have been named. Two of the projects, 5 and 7, have been financed in two consecutive periods. In both cases, a project of the second modality has been set up to identify unmet social demands. This has been followed by a first modality project aiming to develop a solution to the respective problem.

4.1 Findings

The sample of projects included in the study has been based on the availability of responsible researchers from the faculties of interest. Strikingly, all projects address either issues of health or problems of people living in a situation of disability. A possible explanation could be that the expertise of basic scientists and technicians, respectively, fit these two forms of social exclusion best.

Both types of problems are often linked to relative economic poverty. For example, severe body burns more frequently occur in poor segments of society because of precarious homes and heating systems. Certain diseases tend to occur in segments of the population that live geographically remote, for instance, lead poisoning in miners, or parasites in children from disadvantaged neighbourhoods. People in a situation of disability sometimes find themselves excluded from social activities because they cannot afford technical devices, such as incontinence control. These examples illustrate that horizontal and vertical inequality, as defined by Trojer, Rydhagen and Kjellqvist (2014), often coincide and are simultaneously addressed by many of the research projects in this study.

In section 4.1, the five subquestions are examined with respect to the statements made by interview partners as well as using the written sources of data. Even though the heterogeneity of examples has been limited by placing the focus of the study on two specific groups of researchers, every project responsible's experience is different. Consequently, the findings aim to portray the richness of individual accounts while emphasising aspects that are reoccurring throughout the projects.

Table 1: Overview of eleven research projects funded in the programme *Research and Innovation for Social Inclusion*, 2008-2019, own presentation based on CSIC (2020)

	Initiation	**Objective of the Research Project**	**Project responsible(s)**
1	2008	On the search for a solution of treatment of injuries and burnings in high risk populations	Faculty of Chemistry
2	2008	Early detection of group B streptococcal infections in pregnant women as a means to prevent morbidity in neonates	Faculty of Chemistry
3	2008	Development of an algorithm for the statistical comparison of functional neuroimages of the same individual. Application to the subtraction of the ictal and interictal SPECT corrected with MRI in refractory epilepsy	Faculty of Engineering, Faculty of Medicine
4	2010	Increasing the analytical capacity for universal control of lead poisoning in Uruguay	Faculty of Science
5	2010	Epidemiology of human toxocariasis in children from communities located in the urban-rural interface of the metropolitan area: Development of molecular tools for the identification and diagnosis of toxocara canis	Faculty of Science
	2012	Epidemiology of human toxocariasis in children from communities in contexts of social vulnerability in the metropolitan area: Further development of molecular tools for the identification and diagnosis of toxocara canis	Faculty of Science
6	2014	Research Project on Orthosis and 3D printing	School of Industrial Design
7	2014	Dalavuelta. Research in mechanical engineering for social inclusion of people with disabilities	Faculty of Engineering
	2016	Dalavuelta. Applied research in interdisciplinary spaces for the inclusion of people with motor disabilities	Faculty of Engineering
8	2016	Development and strengthening of strategies for the sensitive and early detection of carriers of genes susceptible to inherited colon cancer, aimed at the population with low socioeconomic resources who do not currently have access to testing	Faculty of Science
9	2019	Towards a better quality of life: development and adaptation of technologies for fecal and urinary incontinence control in populations with spinal cord injuries	Faculty of Engineering
10	2019	Design of a device to promote the continuity of walking of Parkinson's patients	Faculty of Architecture, Design and Urbanisation
11	2019	Recommendation guide as a tool for the design of clothing that complies with the principles of universal design for people with disabilities	Faculty of Architecture, Design and Urbanisation

4.1.1 Research in the Context of Latin American Innovation Systems

This section aims to answer the first subquestion of how the researchers from the fields of basic science and technology perceive their roles in a Latin American system of innovation.

Aspects of deficiency in the Uruguayan productive system regarding problems of social inclusion have been described by several researchers. For instance, an engineer illustrated that except for two small manufacturing garages, there is no local production of aids for people with motor disabilities, and especially no product development. Other than that, products are imported and partially donated from the Global North. The imported products – unless covered by insurance – are very high priced and thus often not affordable to people in a situation of disability. There are more examples of innovations that solve the problems of a disadvantaged sector of society and exist on the global market, but are not affordable or available to large parts of the affected population in Uruguay. This applies, for instance, to genetic tests to detect carriers of genes susceptible to inherited colon cancer, assistive technologies for predicting physiological needs of people with spinal cord injuries, or artificial skin to transplant victims of burnings or injuries. Also in the daily work of researchers, certain parts of equipment have to be imported which can impose certain bureaucratic obstacles and additional expenses.

One of the chemists mentioned that from her experience in different regions of Spain, the industry is interacting more with universities than in Uruguay, at least in highly industrialised areas like Basque country. She considered it desirable for the Uruguayan industry to report their demands to the university, use its services, and have more university trained experts working in the industry to advance its innovative capacity. Similarly, another scientist reported that working in Germany he observed a stronger link between the finance sector, the industry, and academic chemistry. However, he viewed rather critically when universities have to earn profit by sharing knowledge with the private sector. The increasing interconnection of the university and the industry described among others by Reddy (2011), has been confirmed by many interviewees who indicated that it is a common channel for research ideas to come up through enquiries from the private sector. Relating to the links between industry and the public university in Uruguay, an engineer expressed concerns that there might be an imbalance between big industries which can approach academia more easily than small or medium companies, or vulnerable industries.

The researchers also emphasised the important role of the public university in the Uruguayan innovation system. Contributing almost 80%, the UdelaR maintains scientific research in the country, one of the interviewees said. Another researcher pointed at the special position of the UdelaR with regards to its long tradition and the fact that it is the only public university as something not comparable to other countries. In this context, two interviewees welcomed that the UdelaR started to decentralise and set up more institutions in the rural parts outside the metropolitan area of Montevideo. Giving the example of the trypanosome cruzi parasite, one of the scientists illustrated that especially the rural and poor populations of Central and South America continue to be affected by so-called neglected tropical diseases. Thus she claims that research is necessary to solve problems of social inequality. Furthermore, the special role of Latin American universities in providing education as a tool for development and progress towards a more just society has been stressed.

Two interviewees – one from the faculty of sciences and one from the faculty of architecture, design and urbanisation – stated that they perceive Uruguayan policy makers as very attentive to matters of social inclusion. From their experiences working in Spain and Germany, both had the impression that innovation for social inclusion played a bigger role in Uruguay and

were unsure whether that is because the social problems are more evident or because they are more in the focus of political decisions. A researcher from the faculty of chemistry described that social demands have been increasing and are recognised more, as researchers become more receptive to needs of the disadvantaged parts of society.

Nevertheless, several researchers mentioned that funding opportunities in Uruguay are very scarce. A researcher from the school of industrial design described that the university has certain overcapacities that are not used because they lack resources rather than opportunities. Several researchers have mentioned that their research projects could not be conducted in the depth they intended to or could not be continued because of the amount or lack of funding. Accordingly, the researchers are directly affected by the lack of resources that results from comparatively low levels of investment in R&D in Uruguay (Göransson & Brundenius, 2011).

To sum up, in describing the Uruguayan national innovation system, aspects such as the deficiencies of the industrial system and the reliance on imports have come up. Even though they are increasing, links between the industry and the university are described as much weaker than in some European countries. The university is characterised as playing a decisive role in the national innovation system and as attentive towards problems of society. However, the scarcity of financial resources in the system is a reoccurring issue.

4.1.2 The Social Responsibility of Research

Next, the second subquestion of how the researchers from fields of basic science and technology perceive the social responsibility of their role will be answered.

Strikingly, the importance and social responsibility of the public university has been emphasised in every interview. The UdelaR has generally been described as very committed to society. Most interview partners have brought up the three missions of teaching, research, and extension without being explicitly asked for them.

Some of the scholars have named teaching as their main activity and as the most important mission of a university. One stated that she sees education as the key aspect of social inclusion which a university can provide since it truly contributes to the empowerment of people. Generally, the provision of free education and the democratisation of knowledge are highly valued among the researchers of the sample. “The university should be accessible to the largest possible number of students, of all sectors of the population”, said one of the participants. One industrial designer pointed out that continuously students being the first ones in their family to pursue third level education come to the UdelaR. Two researchers stated that because they received free education themselves, they felt an urge to give back to society.

Another main function of the university is the mission of research. Indeed, the coordinator of the fund *Research and Innovation for Social Inclusion* stated that “[…] the first thing that we need to stress is that this is research. There are many other ways to address people's needs, but what we wanted to do is research. It is not the only thing and I don’t think it’s the most

important, but it is our trail." Similarly, one of the chemists explained that from his point of view, doing basic research is a form of contributing to society because it generates solutions to problems. A microbiologist reported that after working in the United States, she wanted to return to Latin America in order to use her expertise to solve problems of the region. Another interviewee stressed that researchers' critical thinking and evidence-based reasoning are valuable assets to add to the societal discourse. Several scholars emphasised that the strength of the public university is that it allows independently providing and contesting knowledge.

The concept of extension constitutes the third integral mission of universities in Latin America. Consistently, the interview partners in this study understand extension as the connection with 'another', with society, actors surrounding the university, or 'in territory'. One engineer named extension as a means through which researchers can make their expertise and knowledge more directly beneficent to society. Among others, a design researcher emphasised the importance of creating knowledge 'with another' and not solely 'for another'. A particular focus on excluded parts of society, as traditionally incorporated in the definition of extension (Arocena & Sutz, 2005), has been explicitly mentioned only by one researcher. The two responsibles of a project in basic science stated that they prefer a broad definition of extension which incorporates diverse forms of solving problems and spreading knowledge.

Even though the programme *Research and Innovation for Social Inclusion* aims to comply with the social mission of the university through research, it appears that in this case, the distinction of research and extension may not be as clear cut to some of the researchers. Several researchers have used terms like 'technical projects', 'projects more oriented at the scientific part', or 'entirely academic' to distinguish projects with an open research agenda from projects for social inclusion. This might be due to the significant differences between these different types of research projects which will be addressed in section 4.1.3. Moreover, a chemist stressed how difficult it is for her to find research problems that are equally socially and academically relevant. One researcher made a very clear distinction between science in the sense of 'pushing the knowledge frontier', and his project on social inclusion which he did not consider pushing the knowledge frontier. An engineer described that his research group for the project of social inclusion formed more with the vision of extension. These examples show that for many of the technicians and basic scientists, it is a major challenge to align social relevance and academic excellence.

Research agendas and how these are set are a crucial aspect to the work of researchers. Two of the basic scientists have highlighted the academic freedom which the UdelaR provides by not giving researchers any obligation on what to research. Several interview partners have described a natural trajectory in many researchers' careers; where one answered research question opens up several consecutive questions so that some scholars work on a specific topic all their careers. One engineer evaluated this as a drawback of Uruguayan scholars doing their PhDs abroad, for instance. He observed that even as they return to Uruguay, many of his peers continue working on the same problems as their colleagues in the Global North rather than dedicating research efforts to local problems. Despite the natural trajectory in research lines, some researchers have mentioned their motives for diverging from their paths to a certain degree and investigating an issue of social inclusion for the first time. Besides the conviction of doing something 'directly useful' for society, scientific curiosity has been named as the major reason of a chemist, a molecular biologist, and an engineer to participate

in a project of CSIC's *Research and Innovation for Social Inclusion*. In several cases, a personal experience like being affected by a disease – either the researchers themselves or a close relative – has inspired the wish to improve the conditions of the affected populations. In the cases of projects 2 and 3, medical researchers reached out to the chemist and the engineer, respectively, because they needed the expertise of these disciplines for the development of a solution. As can be seen from these examples, the generation of research ideas is frequently dependent on chance or coincidence. As a consequence, the coordinator of CSIC's programme for social inclusion described part of her work as trying to institutionalise chance, for instance, by bringing together researchers from different disciplines with other societal actors or disadvantaged groups of society. This has been done, for instance, by organising workshops or open days (Alzugaray et al. 2014).

There is a significant gap between researchers from the fields of basic science and technology as opposed to social scientists or medical researchers in applying to the programme for social inclusion. Out of the 230 applications to the programme between 2012 and 2019, 118 came from the social field while five and twenty originated from basic science and technological areas, respectively, and 78 addressed issues of health (Unidad Académica, 2020). The most common explanation for this gap that study participants gave is that researchers from the fields of technology and basic science are more distant from problems of social inclusion and thus less aware of what they can contribute. From the experience of the coordinator, social scientists usually understand much better which type of problems the programme aims to address, whereas technological researchers and basic scientists often are unsure of this. Yet apparently, this does not apply to the design researchers who participated in this study as they described their discipline to traditionally place the person at the core of the research project.

The terminology and the way a call is framed can be important factors in this, too. For example, a CSIC researcher observed that since they use more terms such as 'assistive technologies' instead of 'social inclusion', more technological researchers felt addressed and applied in recent years. In this context, an industrial designer reasoned that the way in which the social problem is defined might exclude certain possibilities. Her colleague explained that she understands social aspects in a broader sense than what is traditionally defined as social, for instance, considering issues of environmental sustainability. One of the researchers stated that in some projects the link to social inclusion is more obvious than in others. Since programmes for social inclusion tend to be less competitive, he reasoned that the chances to receive funding can be increased when the research question is framed as a problem of social inclusion. Indeed, according to the coordinator, on average the academic unit receives 50 applications for a call of the fund for social inclusion as opposed to 500 applications for programmes with an open agenda. Moreover, the rate of approval is particularly high for projects in the fields of technology and basic science, where respectively 8 out of 20 and 2 out of 5 had been financed between 2012 and 2019 (Unidad Académica, 2020).

In conclusion, the researchers in this study seem to assign a big social responsibility to the public university of Uruguay, including all of its three missions of teaching, research, and extension. However, for researchers from basic science and technology in particular, it can be difficult to find problems of social inclusion which they can specifically address with their work in research. Unless they get in touch with a problem of inequality or learn about this

type of research, for example, through the active promotion of the programme, they might simply not consider this possibility in their research trajectories.

4.1.3 Differences between Research for Social Inclusion and Classic Research

In the next section, the differences that basic scientists and technological researchers perceive between researching for social inclusion as opposed to research with an open agenda are presented. As has been mentioned, there is a natural trajectory in many scientific careers which causes scholars to follow a more or less consistent line. For the majority of basic scientists and technological researchers participating in this study, it had been a new experience to investigate a problem of social inequality. However, some have worked with issues of social inclusion before and the researchers from the project of universal clothing almost exclusively choose research topics related to people in situation of disability. The scholars who have made experiences with both types of research have described the following differences.

A major characteristic of research for social inclusion in contrast to many other projects is the dependence on interacting and cooperating with non-academic actors. These could be the potential users of an innovation, for instance, people with spinal cord injuries or people in need of technical aids for mobility. Furthermore, some projects require the communication with stakeholders like caregivers of Parkinson's patients, associations like UNCU (National Union of the Blind in Uruguay), or primary care doctors whose awareness of signs of inherited colon cancer is to be increased. Also building and maintaining relationships with people in respective ministries or city councils can be part of researching for social inclusion, as the responsible of the project on lead poisoning explained. He said "I've always been inside a lab and inside the library, I never went out. I […] never knew how to make it useful, my work." In contrast, the project for social inclusion he described with the words "I've never [spent] so much time in the street, knocking doors, talking outside […]." In this context, new strategies of communication and a different use of language have become relevant for many of the researchers. For example, the engineer involved with devices for incontinence control described how he learned to explain technological details in a less technical language, while at the same time gaining an understanding and new insights from the users' perspective.

Moreover, projects oriented at social inclusion and more classic forms of research are perceived as distinct by their goals. Projects with an open research agenda typically terminate with an academic publication, whereas the goal of improving the conditions of a marginalised group is prevailing in projects for social inclusion. A biochemist mentioned that investigating the problem of human toxocariasis in children from disadvantaged neighbourhoods, she felt less obliged to publish scholarly articles. For the engineer working on an algorithm detecting seizures in the neuroimages of refractory epilepsy patients, the goal of improving the conditions of the patient was very clear and urgent throughout the work on the project.

The forms of publishing can be very different for research oriented at problems of inequality as opposed to research with an open agenda. In most of the projects of this study, the results have not been published in scientific journals as is common with more classic forms of

research. A chemist and a medical researcher indicated that there are journals which publish research with relation to more local problems or even journals that combine analytical methods with societal impact. However, to most researchers in this study, a broad diffusion of the solution was prioritised over a scientific publication. For example, the development of the synthetic skin, the research on lead poisoning, and the Dalavuelta project for improved handicap mobility have been covered in the broad media including newspaper and television. One of the scientists stated that the project for social inclusion has made him more nationally and internationally famous than all his prior work. It is an integral part of many of the projects to make them known among the affected populations and other stakeholders. For instance, the responsible geneticist of the project on early detection of colon cancer stressed that raising awareness among primary care doctors, but also in the general public was one of the main objectives of the project. Also in the context of publishing, finding an appropriate use of language proved to be important and very distinct from classic research projects. She and her team dedicated a lot of time to produce videos for social media which would catch the attention of a broad audience while also conveying the scientific basis of their findings.

To sum up, projects of social inclusion are primarily distinct from more classic forms of research by the involvement of non-academic actors, different objectives, and other modes of publication.

4.1.4 Rewards and Obstacles to Research for Social Inclusion

The fourth subquestion aims at defining the rewards which researchers from the fields of basic science and technology gain while investigating an issue of social inclusion as well as the obstacles which they encounter in doing so. Many interview partners have described gains or problems very specific to their research projects. However, what is presented here will be reoccurring benefits or difficulties throughout several projects or integral to the research on problems of social inclusion.

Many of the interviewees have described the aforementioned interaction with actors from outside the university context as the most challenging or the most difficult part. One engineer stressed that researching on a problem which involves interacting with more stakeholders bears additional uncertainties, as the outcome no longer depends only on the researchers' work. The team of the universal clothing project reported that in preparing the research proposal, they had to make several attempts to connect with associations before receiving a response. Also the group investigating the possibilities of 3D printing in the production of orthoses described building trust and maintaining relationships with the non-academic stakeholders as the most complicated part. Working with societal actors has been described as more time-consuming than doing research in the lab or in the university, especially when it incorporates travelling to the more rural parts of Uruguay. Moreover, a researcher described that from the moment he engages with potential users, he feels additional pressure as he does not want to disappoint their expectations. Even though it can entail additional effort, the interaction with non-academic stakeholders has also been characterised as important and eye-opening. An engineer who had been in exchange with people with injuries of the spinal cord described his experience as follows.

> The way of explaining how a device works, you have to do it in concrete and simple terms, in the same way like when I talked to these patients, there are numerous problems I had no idea they existed. They had to tell me because I was completely unaware of the problems they are facing. How to move in a wheelchair, what it means to have a spinal injury, in that respect I was completely clueless.

Furthermore, working in multidisciplinary groups can imply additional effort. While this is not considered as specific to research for social inclusion, but rather an aspect of the academic work that is generally gaining in importance, interviewees have mentioned some difficulties in communication. The ways of approaching a problem can vary between distinct disciplines. For instance, in the initial phase of developing a device that facilitates the mobility of Parkinson's patients at home, the engineering experts wanted to start building and testing, while design experts stressed the importance of interviewing and assessing the needs of the users first. However, overall multidisciplinarity has been described as enriching and valuable for the research process. An electro engineer from the project of neuroimaging emphasised the positive experience of working with the researchers from the medical faculty. She said the work was truly interdisciplinary as the engineering side did not merely develop something for the medical scientists, but over the years gained so much subject-specific knowledge that they could contribute their own continuative ideas.

As has been mentioned above, from most of the research endeavours in this study, there has not resulted a scientific article to be published in a high impact journal. As described by Sutz (2003), this can be an obstacle to investigating a socially demanded issue since the evaluation of academics is largely based on scientific publications. However, not all research groups faced this problem; for example, the team from project 3 reported that aligned academic and social relevance without any difficulty. Furthermore, many of the interviewees have pointed at the fact that the UdelaR's evaluation of academics is based on their work in the three areas of teaching, research, and extension. One engineer explained that the engagement of researchers with society is incorporated in the evaluation made by superiors or peers. However, several interviewees from the faculties of engineering, natural science, and chemistry have stated that there is an imbalance and that projects aimed at social inclusion are not recognised adequately in the evaluation. A chemist and a geneticist explained that only because they continued working on other projects in parallel, they could maintain the necessary rhythm of publishing to not have negative impacts on their academic careers. Many researchers felt like the effort they have put in the projects has not been valued enough, also considering the time-consuming nature of certain tasks that come with researching on issues of social inclusion. One researcher criticised that the low recognition for these types of research contradicts what the public university communicates as its role and mission in society.

In terms of rewards that have been gained, most researchers pointed at the learning experience. Also the programme coordinator assessed that doing research in itself is very rewarding to most scholars. One of the chemists explained that there is something fulfilling to take from every type of project and that learning is very important to him. The engineer from the project on neuroimaging said that understanding a complex set of problems was the most satisfactory part to her and very enriching to everyone involved, including students. One of the basic scientists emphasised that studying the trypanosome cruzi parasite is highly relevant

for the affected, underprivileged segments of the population, but also particularly interesting from a biological point of view. Many researchers have emphasised that they learned to put themselves in the shoes of another – be it a scholar from a different discipline or someone from outside the academic context – and to adapt their own communication. In this context, aspects of personal growth have been mentioned.

Besides the learning experience, improving the conditions of a disadvantaged part of society is seen as a reward to the work. One of the designers from project 11 said that it would be her biggest reward to know that the guide on universal clothing will be the outcome and ideally available to anyone designing wear. A researcher from the field of biochemistry described that for her, "[t]he greatest satisfaction is to contribute something, a small grain of sand, to improve social inclusion." Importantly, the contribution an innovation can make to solve a problem of inequality greatly depends on its implementation. However, the application of results has been another major obstacle to many of the projects as will be further explained in section 4.1.5.

To sum up, most of the rewards and obstacles described by Alzugaray et al. (2014) have been confirmed for the group of researchers from basic science and technology. The learning experience, the contribution to social inclusion, and interaction with actors from different disciplines or outside the university context are described as rewards of investigating a problem of social inclusion. Yet, the very interaction as well as the lower academic valuation and problems of implementation are also perceived as obstacles to engage in this type of research.

4.1.5 The Impact of Research for Social Inclusion

The fifth and final subquestion aims at understanding how researchers from the fields of basic science and technology perceive the impact they could make investigating an issue of social inclusion.

In this context, it is important to consider that the projects which have been initiated between 2008 and 2019 are currently at very different stages of development. The teams whose projects have been approved in 2019 are only about to take the first steps. The leading researcher of project 9 expressed his concern as their progress is likely going to be affected by the coronavirus outbreak, especially considering the important role of interaction between the various stakeholders. On the other hand, projects initiated in the earlier phase of the programme are for the most part finished; however, might not have been completed in the way they were intended. For instance, all steps of the project on streptococcal infections in pregnant women had been undertaken as planned, yet the rapid test never reached the required sensitivity to detect bacteria in low concentration. The project could not be continued because no more funding could be secured. Nowadays, these devices can be imported to Uruguay more cheaply from China. Also the development of the synthetic skin has been accomplished; however, it has never been clinically tested in human beings. The responsible chemist declared that the closest they have got to an implementation was to present the skin to the ethics committee of the burn centre of the clinical hospital. According to the coordinator of the programme for social inclusion, the development of synthetic skin has been accomplished

from the chemical side, but not from the medical side which would have been decisive in solving the social problem. However, she points out that the results of the project could be taken up or used when circumstances are more favourable.

Across the research projects for social inclusion, many problems of implementation have occurred. To a certain degree, the reason lies in the nature of the problems which are not solved in the moment a scientific innovation is generated, but when it is actually reaching the affected population. The chemist working on lead poisoning defined the duty of the university as finding a solution to a problem, but then to get rid of the solution in order to be free to develop a new solution to another problem. He said, the university could not keep the solution to itself but should give it to political actors. However, the programme coordinator reported that, for instance, the ministry of social affairs does not have the capacity to promote the further development because it has many other, seemingly more urgent problems to solve. Similarly, other researchers have been agonising on what to do with the structures they built after the research project has been completed. For example, after ending the study on inherited colon cancer, the university laboratory could not continue to provide genetic tests to people at risk because, as the project responsible said, the university does not have the resources to provide this as a service. So she hopes that a laboratory from the private sector will fill this gap, especially because she perceived that the goal of raising awareness among the general public has been accomplished. Also the engineer involved with the 3D printing of orthoses expressed an ambivalent feeling of, on the one hand having successfully found a solution, the simple and cost-efficient production of orthoses for growing children, but not being able to provide it continuously. Similarly, the group working on human toxocariasis in children managed to develop diagnostic methods for the detection of the parasite, but did not find a way how to apply it on a large scale because no additional funding could be secured.

As pointed out by the coordinator of the programme for social inclusion, the university can generate prototypes but it cannot and should not manufacture products in large quantities. In this context, the concept of open knowledge has been reoccurring throughout the interviews. For instance, the group of Dalavuelta shares the developed construction plans of technical aids that solve problems of accessibility like wheelchairs to be used at the beach freely. They approve if any private company wants to manufacture their design, as long as it improves the mobility of people in situation of disability. Similarly, the researchers who are developing a guide for universal clothing aim to provide it to design schools as well as private brands to ensure that more clothes are designed to fit everyone.

Making an innovation ready to be applied can be a long-term undertaking. For instance, the neuroimaging software that was initially financed by CSIC in 2008 is planned to be used starting this year, after many consecutive periods of funding from different sources. The impact it is aspired to make will be twofold; facilitating the diagnostic of physicians and improving the conditions of refractory epilepsy patients.

Regardless of whether a solution could be implemented or not, there is usually some impact that the researchers felt they made with their projects. An aspect that has been emphasised frequently is the involvement of students in the projects for social inclusion. One engineer is convinced that this sensibilises the younger generations for the needs of underprivileged groups of society and strengthens their idea of interdisciplinarity; assets they will potentially

use in their future careers. Another example is that several of the students involved with project 3 decided to pursue a career in academia and continued working on similar aspects after they participated in the research for social inclusion. In most of the projects, students have been involved at different stages of their education and, just like the researchers themselves, have benefitted from the learning experience.

Furthermore, participating in the programme for social inclusion also had a lasting impact on the research agendas of many of the basic scientists and technological researchers. For instance, the scientist working on a more affordable way to measure lead poisoning, afterwards continued with projects on lead contamination in wall paints.

Despite the fact that the impact of the projects is not always evident or measurable, the coordinator of the programme states that not providing it anymore is not an alternative to her.

> Because it is good in itself. Because there are a lot of students that work in the projects. Because there are people that get involved. And sometimes, sometimes, we have successes.

In summary, the impact that researchers from the fields of basic science and technology could make participating in the programme for social inclusion is largely perceived as positive, although the implementation of results could not be advanced as planned in many cases. The reasons for this often relate to the problems of underdeveloped innovation systems (Sutz, 2003), including scarce resources in the R&D sector and missing linkages to powerful actors in the industry and politics.

4.2 Chapter Summary: Motives and Obstacles to Research on Social Inclusion

By answering the subquestions in the previous section, many aspects relating to the main research question have been covered in detail. In the following section, the motives and obstacles for basic scientists and technological researchers to investigate issues of social inclusion are summarised, complemented, and elaborated in relation to the theory.

As has been mentioned, the motives for researchers to work on problems of inequality are manifold and individual. Yet, among the participants of the study, there is the wide-spread persuasion that the public university as a societal actor should comply with its social mission in the three pillars of teaching, research, and extension. Accordingly, many are convinced that their research should contribute to reducing social inequalities in the population. Furthermore, having received free education themselves and being paid by tax-payers money, some feel it is their duty to repay to society. D'Este, Llopis and Yegros (2013) have described that researchers who attribute social relevance as an important goal of research more often engage in research activities that relate to actors outside the university context. Based on their statements on the social responsibility of research, this also applies to the majority of scholars in this study. However, a potential bias towards social desirability has to be considered.

Naturally, there is a great variety in the research agendas and trajectories of basic scientists and technological researchers participating in this study. While a few have been working on

problems of social inclusion all their careers, for the majority it has been the first time. Some designed their studies exclusively for the programme or joined its workshops to generate a research topic, whereas others had a clear research idea in mind and found CSIC's programme while looking for a funding opportunity, possibly modifying the proposal to make it fit the requirements of social inclusion. One stated to have applied to the programme because he knew it was less competitive than the programmes for research with an open agenda. Many scholars mentioned that they learned about the programme through the promotion efforts of CSIC, for instance, coming to the faculties of chemistry and engineering, and one stated that he had read an article about the programme which inspired him.

The motives for researching a problem of inequality can also be related to very personal experiences, for example, being in touch with someone who lives with a disease or in a situation of disability. Generally, many ideas for research result from coincidences, like meeting a scholar from another field who has a matching idea, and require certain conditions to fall into place. Also scientific curiosity, a particularly interesting problem, and trying to challenge the routines have been named as reasons to participate. A few researchers have described it as unacceptable to know that a problem someone suffers from can be solved or that a solution already exists in other parts of the world, and not do something about it.

Important reasons why researchers from the fields of technology and basic science might not consider investigating an issue of social inclusion are that they do not feel addressed by the formulation of the call or lack imagination of what they can contribute from their expertise to solve a problem of inequality. Many of the researchers described themselves as being in this position before they learned in detail what the programme is about and how it potentially relates to their work. One interviewee suggested that being exposed to more examples of projects for social inclusion conducted by researchers from the same field could be a source of inspiration.

However, more obstacles potentially keep basic scientists and technological researchers from participating in CSIC's programme oriented at social inclusion. For instance, some of the researchers perceive that this type of research receives less recognition in the evaluation of their work. This is largely because most of the projects have not led to results that could be published in academic journals, although this constitutes an important aspect of the academic reward system (Arocena & Sutz, 2011). Another obstacle that most of the scholars in this study confirmed was that working with non-academic stakeholders is time-consuming and requires more effort in terms of communication (Alzugaray et al. 2014). As interviewees have described, it implies leaving one's comfort zone, potentially leaving the own field of expertise, and in the literal sense leaving the university or the laboratory. For most scholars, working in multidisciplinary teams is not specifically attributed to research for social inclusion and, despite certain difficulties in adapting the technical language or work processes, evaluated positively. More obstacles described by Alzugaray et al. (2014) also apply to the specific group of technological and basic scientists examined in this study. These include the uncertainty of results, especially with regards to their implementation. This can be a frustrating experience and often is the consequence of the lack of certain structures in an underdeveloped innovation system (Sutz, 2003).

To sum up, the motives and obstacles which have been described in the literature have been largely confirmed by the exemplary research projects of this study. Furthermore, the particularity of the situation of basic scientists and technological researchers has been differentiated. Importantly, it needs to be taken into account that the situation is described based on the perception of the researchers. Generally, all of the interviewees declared that they would participate again in a project for social inclusion, given they had an adequate case for research and circumstances were favourable.

5 Conclusion

Inequalities between the Global North and South become apparent in comparing their systems of innovation. Concerning research and development, the capacities still seem largely concentrated in the more economically developed countries. In times when the speed of innovation accelerates and the economic importance of knowledge grows, this constitutes a disadvantageous starting position for many countries of the Global South such as Uruguay. On the other hand, opposing the dominant paradigm of economic growth, human sustainable development and inclusive growth are increasingly seen as goals to be achieved, using the capabilities of research. In this context, Uruguay's public university is actively promoting the combination of scientific advancement with problems of social relevance. The programme *Research and Innovation for Social Inclusion* is a means by which the research council of the UdelaR incentivises academics to consider problems of inequality in their research agendas. It can be considered a *social innovation* as it aims to fill a gap left by markets and states, creates novel linkages between different actors of society, and empowers marginalised groups. After more than ten years of providing funds through this programme, it still receives significantly fewer applications than programmes with an open agenda, especially from the fields of basic science and technology.

5.1 Research Aim

The aim of the study has been to understand the role of researchers in the Global South in achieving human sustainable development. This has been approached on the basis of a case study of research for social inclusion in the fields of basic science and technology at Uruguay's public university. Specifically, the aim has been accomplished by shedding more light on the motives that cause researchers to investigate an issue of social inclusion as well as the obstacles they encounter while doing so. Important motives include the persuasion that research has a social responsibility, being affected personally, scientific curiosity, or practical reasons. The major obstacles are not knowing how one's expertise in basic science or technology can contribute to a problem of social inclusion, additional efforts to interact with non-academic actors, and a comparatively lower academic valuation of this type of projects. Thus, the study confirmed previous findings also for this specific group of researchers and added more differentiated examples.

5.2 Implications

As the sample of the study includes a large share of all basic scientists and technological researchers who have participated in CSIC's programme for social inclusion, it is reasonable to generalise to the whole of this specific group. Accordingly, the first type of empirical generalisation is valid. Based on the experiences reported in this study, Uruguayan policy makers or university responsibles can draw preliminary conclusions if they aim to promote that researchers from the fields of basic science and technology engage more in problems of social inclusion. Measures to achieve this could be to continue making the programme more known in the respective faculties, providing examples of projects as a source of inspiration, bringing together researchers and non-academic actors, and recognising more these types of projects in the academic evaluation. Formulating the calls to specifically address technology researchers and basic scientists language-wise has proven effective and should be maintained.

With regards to the second type of empirical generalisation, it depends on the context of the respective country and the structure of potentially similar research programmes, to which extent findings from the Uruguayan setting can be inferred to other countries and their universities. However, it is probable that the national innovation systems including the role of the universities are sufficiently comparable to other countries of the Southern Cone and in Latin America.

Furthermore, as growing inequalities within countries are not only a problem of the Global South, but affect countries at every stage of development, models of how to foster human sustainable development and inclusive growth are just as relevant for the Global North. Also with regards to planetary boundaries and intergenerational justice, it is important to direct research efforts at improving the quality of life of people rather than merely satisfying consumer demands.

5.3 Future Research

Many open questions remain to be answered by future research. Regarding the case of research for social inclusion, the experiences of more researchers should be assessed to test this study's findings. More disciplines or alternative sources of funding, for instance, from the private sector or international loans, could be analysed to understand the contribution of R&D to solving problems of inequality. In doing so, larger-scale qualitative studies can find answers to questions of how or why, whereas quantitative studies potentially provide a broader overview of the phenomenon. Moreover, the perspective of non-academic stakeholders could be emphasised more in future studies.

Therefore, the concepts of social and inclusive innovations need to be developed further, also with regards to measuring their impacts on society. This would be particularly important in order to make them an object of policy. As such, different models that promote human

sustainable development should be elaborated and tested. This could be in the context of university research as well as in many other areas of society.

The study has shown that the role of universities and researchers in the Global South deserves more attention as they can play a key role in the reduction of inequality within and between countries. To ensure a higher probability of implementation for research findings, the barriers that hinder knowledge transfers to society in national innovation systems of the Global South need to be examined further.

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Appendix A

Interview Guide

Introduction

The study aims to understand the role of researchers from the fields of technology and basic science in participating in the program "Research and Innovation for Social Inclusion" and investigating on socially demanded issues.

Interviewer

The research is carried out by Annika Ralfs, as part of the master program "Innovation and Global Sustainable Development" at Lund University. The project is supervised by Judith Sutz and Cecilia Tomassini from the academic unit of CSIC at Universidad de la República.

Contact Annika Ralfs: an7227ra-s@student.lu.se; +49 178 9612219

Participant

Name:

Job Title:

Faculty:

Participant Consent

The interview will be digitally recorded, and the interviewer will take notes. Both notes and recordings will remain confidential. We are aware that these interviews may include risks by discussing sensitive information. These risks will be mitigated by a strict protection of the data. Only the researchers in the project will have access to the notes.

Your personal identity will remain anonymous. No views will be directly attributed to you in any document that may be produced from the interviews. The name of your institution may however be known in the report unless you explicitly indicate otherwise. The information gathered from this study will be used to contribute to the project. It may be presented in the form of a report, a paper to a colloquium and/or a published scientific paper. The recording can be paused and consent can be withdrawn at any time.

The interview will take approximately one hour. It will cover your general views on the role of researchers and universities and your personal experience with the program "Research and Innovation for Social Inclusion", including motivation, obstacles, rewards and suggestions for improvement. Feel free to take time to think before you answer. There are no right or wrong answers!

I. Icebreaker Questions

- Tell me about your work.
- Which research lines do you follow?

II. Role as Researcher

- How do you understand your role as an academic at UdelaR? (For example, which are your main activities?)
- How do you understand the role of researchers at a public university in society?
- Do you think that role is the same in other countries of Latin America? (At the international level e.g. in developed countries?)
- What is your take on the concept of extension?
- How do you select the topics of your research agenda? (Do demands of non-academic actors play a role?)

III. Motivation

- How did you learn about the program "Research and Innovation for Social Inclusion"?
- Which was your main motive for applying to the program?
- What did you initially expect from the program?
- Which had been your alternative options?
- Why did you not apply for R&D or other forms of classic research?
- Comparing research oriented at social inclusion and researching with an open agenda, what strikes you as different?

IV. Research Project

- Describe the topic of your research project in the program.
- Describe the process of your project.
  - How did you come across the social problem?
  - Had you been aware of the problem before working with the program?

- Who are the relevant actors involved with your project?
- How did you experience working in a multidisciplinary team of researchers?
- Which non-academic actors have been involved?
- In which way did they participate in the project?
- To which degree have the non-academic actors been involved in each of the stages of the process?
- How did you experience working with non-academic partners?
(- How did you translate the social problem into a research project?)
- Have the results of your project been implemented? (If not, why not?)

V. Impact

- □ How did you perceive the impact you could make with the project?
- □ How was the feedback from users or other stakeholders?

VI. Obstacles

- □ Did you face any obstacles working on the project? (If so, did you manage to overcome these obstacles?)
- □ Did you encounter difficulties or inconveniences working with the program?

VII. Rewards

- □ Did you gain any rewards from working on the project (a social problem)?
- □ Did you have benefits from working with the program?

VIII. Personal Career

- □ Did working on this social problem influence your research agenda?
- □ Did you ever feel there is a trade-off between investigating an issue of national interest (like project XY) as opposed to engaging in international research?
- □ Have the results of your project been published?

Now we come to the last block of questions.

IX. Improvement

- □ Would you participate in the program again?

- The experience from the program shows that researchers from the fields of technology and basic science are less prone to apply for the program. Why do you think that is?
- Which measures could be taken to make the program more known among these researchers?
- Which measures could be taken to make the program more attractive to technology experts or basic scientists?

X. Closing Questions

- Is there anything more you would like to say that we did not cover?
- Who else could I talk to about the program?

Appendix B

List of keywords and frequency of occurence in the analysis (own presentation)

Name	References
Obstacles, inconveniences	44
Specific to Latin Amercian, Uruguayan university	43
Non-academic Counterparts	35
Basic science and technology researcher	34
How demands come up	33
Differences research for social inclusion, classic research	32
Impact	30
Social problem to be solved	29
Benefits, rewards	27
Multidisciplinarity	25
Role of public university	24
Role as researcher	23
Academic publishing	21
Problems of implementation	19
Influence on research agenda	18
Other forms of publishing	17
Social responsibility of research	16
Motives for applying	16
Extension	15
About the researcher	15
Students	12
Alternative options	11
Specific to the project	11
Learning experience	11
How heard about the program	10
Experience abroad	8
Terminology	7
Government change	7
Open knowledge	5