Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

Elsevier hereby grants permission to make all its COVID-19-related research that is available on the COVID-19 resource centre - including this research content - immediately available in PubMed Central and other publicly funded repositories, such as the WHO COVID database with rights for unrestricted research re-use and analyses in any form or by any means with acknowledgement of the original source. These permissions are granted for free by Elsevier for as long as the COVID-19 resource centre remains active.
Universities and social innovation for global sustainable development as seen from the south

Rodrigo Arocena⁎, Judith Sutz
University of the Republic, Uruguay

ARTICLE INFO

Keywords:
Universities
Global south
Social innovation
National systems of innovation
Deep transitions

ABSTRACT

Potential contributions of universities to social innovation are explored with special attention to Southern countries. The normative guide is the notion of Sustainable Human Development understood as stressing the agency of least-advantaged sectors. The main challenges stem from decreasing sustainability and increasing inequality. Their impacts are highly dependent on how the tension between economic growth and environmental protection is managed. Improving actual perspectives demands harnessing advanced knowledge to foster inclusive and frugal innovation. For this to occur, universities need to be main actors. The context in which they act is analyzed with reference to the National Systems of Innovation conceptualization. Possible evolutions of universities as agents of social innovation are discussed with the aid of the Multi-Level Perspective. The importance of the Southern experience of innovating in scarcity conditions is highlighted and illustrated with the specific experience of a Latin American university. The cooperation of universities with weak social actors in ways that involve advanced knowledge appears as a key theoretical issue and as a difficult practical problem for the effective engagement of universities in social innovation. The diverse issues that such engagement needs to integrate conform an ambitious research program, of which the paper aims at giving a first glimpse.

1. Presentation

Humankind seems to be in its way to an environmental catastrophe compounded with a proliferation of social challenges, particularly the rise in inequality. Social innovations – primarily understood as innovations with social aims - point to changing such track. Given that in several ways knowledge is part of the problems these innovations try to overcome it makes sense to ask if knowledge can be part of the solution. Contributing from a Southern point of view to answer such broad question is a fundamental purpose of our research program that justifies the many issues raised in this paper. Its focus is on a more specific question: can Universities contribute to social innovation including in such effort reorienting the power of knowledge to better serving people? A positive answer requires fostering the cooperation of universities with weak social actors in ways that involve advanced knowledge. This appears as a very difficult problem, considered as follows in this paper.

Section 2 addresses the challenges of inequality and climatic change from the point of view of Sustainable Human Development, a normative guide that highlights the agency of least-advantaged sectors. Its possibilities depend highly on power configurations and their knowledge basis, which at present tend to deepen global challenges.
cooperate in finding new ways for inclusive and frugal innovation, and in generating the needed knowledge. If shielded to some extent, such niches can expand as germ of change at more general levels.

Section 7 exemplifies the considerations of previous sections and the above conjecture by referring to the research and innovation policies of the University of the Republic in Uruguay.

The final recapitulation (Section 8) summarizes some tentative conclusions concerning the potential contributions of Universities to social innovation as seen from the South.

2. Fundamental challenges for a new development

It is widely accepted that lack of sustainability and increasing inequality are major challenges for our time (UNDP, 2019). There are open problems that concern not only the South but also the whole world. A huge amount of social innovation is needed to solve them. This is evident in the widespread consensus that led to the formulation of the Sustainable Development Goals. If a first “deep transition” led, during the last two and a half centuries, from agrarian based societies to societies based on industry and science, posing in its course the two fundamental challenges previously stressed, a second “deep transition” is needed to overcome them (Schot and Kanger, 2018).

Prevailing types of knowledge-based economic growth have, at the same time, diminished poverty, increased inequality and converted environmental problems into a truly global challenge. Economic growth has become thus a decisive issue for governments in almost every political regime, while fostering the fundamental challenges of our age. Coping with them demands reorienting production and use of knowledge.

The notion of Sustainable Human Development, elaborating on the conceptualization of Sen (1999), may provide a general orientation. It can be seen as: (i) the permanent and self-increasing expansion of people’s freedoms and capabilities, both individual and collective, (ii) in order to lead lives that they value and have reason to value, (iii) in ways that not only preserve but moreover widen such possibilities for future generations, (iv) assuming that the expansion of freedoms and capabilities is both the defining aim of development and its main tool, which (v) implies treating people not as patients but as agents.

Development, factually speaking, is fundamentally an issue of power as Weber said about economic development (Gerth and Mills, 1958, p.35). The normative characterization of development, focused on enhancing people’s capabilities for attaining goals that characterize the lives they have reasons to value, points to that issue.

Power relates to the possibilities people have for attaining their goals by controlling their natural and social environment. This demands both material action and coordination of human activities, signaling what may be termed technological power and organizational power; the last stems mainly from economic, political, ideological and military relations (Mann, 1986). Therefore, the facts of power lead to focus on: (1) scientific and technological knowledge; (2) economic, political, ideological and military organized relations; (3) mutual influences between (1) and (2).

The normative emphasis of Sustainable Human Development on agency leads to think in terms of empowerment, specifically of subordinated social sectors. Social innovation contributes to that. The reality of power leads to pay special attention to advanced knowledge, understood as knowledge stemming from systematic scientific and technological research as it is generated particularly in organizations dedicated to knowledge production.

Concerning the last, universities are sites of utmost relevance. They are the most relevant sites of fundamental research and of (potentially) interdisciplinary research, which orients to a considerable degree the research agenda as well as the main avenues that research chooses or avoids. Such orientations permeate society in several ways, particularly by the connections between universities and graduates. The orientations for generating and using advanced knowledge that predominate in universities tend also to shape the future, especially because the formative years of most highly educated people take place there. In knowledge-based capitalist societies, universities are much too relevant to be left out of the political and ideological aspects of the dominant configuration of power. So, to a remarkable extent they are shaped as knowledge business, leading to the prevalence of the “entrepreneurial university” as a discourse and as a model for Higher Education policies. This model extends from the North to the South. Thus, universities worldwide are “objectively” pushed to contribute more to knowledge-based concentration of power than to the reverse process. Moreover, in the South, universities are weakly connected to national knowledge needs, which are often provided for from abroad. The related trend towards following international mainstream research agendas weakens further their prospects as local agents of change.

Here lies a main problem for connecting universities and social innovation.

3. On some dimensions of social innovation

Social innovation (SI) is a concept that won extraordinary prominence in recent years. Notwithstanding, there is no clear-cut consensus around its definition. Characterizations of SI stemming from experiences (Howaldt et al., 2019) and from theoretical and analytical approaches highlight a series of features that offer a frame that is able to harbor quite diverse types of social innovation. However, from the two perspectives suggested in the title of the paper, countries in the peripheries and universities, such frame provides a weak support. With this in mind, we reflect critically on some features of SI.

3.1. Why has the concept of SI gained such momentum recently?

The unfulfilled promises of “progress” in terms of lifting the boat for all is one of the roots of the rising discursive and political importance of social innovation. (Moulaert et al., 2013a) The uneven distribution of benefits from innovation is even more salient where the majority of the population has unfulfilled basic needs. That is a symptom of under-development. When it persists, it is worth to reassess SI in the light of the search for overcoming it. This relates to individuals, groups and communities taking action in response to the problems of unsustainable practices (Mehmood and Parra, 2013). This entails a danger: “Piece-meal, short-term focused, and partial solutions easily turn out to have unintended side effects, reinforcing persistent societal challenges, or even creating new complexities”. (Avelino et al., 2019, p.196)

This stresses the need to reflect conjointly on SI and on the challenges of human and sustainable development when searching for alternative ways of addressing problems. It stresses as well the importance of advanced knowledge to cope with the overwhelming complexity of such endeavor and the associated challenge of promoting different research agendas than those prevailing today. Universities, the site by excellence of knowledge production, need to be partners in the endeavor. (Bayuo et al., 2020) The literature on SI, however, pays little attention to them. This is particularly problematic for the South given that there universities are often the main if not the only site of endogenous advanced research.

3.2. Has SI to do with intentions?

There is no consensus whatsoever in the literature about this point. For some, the definition of SI should not include intentions or outcomes (Avelino et al., 2019; Cajaiba-Santana, 2014), in sharp contrast with those that conceptualize SI as results and goals oriented, “new ideas that meet unmet needs” (Mulgan, 2007, p.4). Other conceptualizations of normative oriented innovations include Responsible Research and Innovation, a concept well developed by now, associated with participatory foresight. (Lehoux et al., 2020) Looking from the South, a normative dimension should inspire all type of innovations, particularly
the scientific-technical ones, so often blind to the unmet needs of those without power—of money, influence or agency—are concepts like innovation oriented towards social inclusion and frugality come to the fore. From this standpoint—accepting that other characterizations are possible—inclusion is inclusive when it is directly oriented to solving problems of most vulnerable people. Frugal innovation happens when “by minimizing the use of resources in development, production and delivery, or by leveraging them in new ways, (…) innovation results in dramatically lower–cost products and services” (Bound and Thornton, 2012, p.6).

Sometimes the literature on SI leads to think that scientific-technical innovation cannot be SI; however, knowledge-based inclusive and frugal innovation deserve to be considered “knowledge-based SI”. A characterization of social innovation that may encompass this is the one based on the agency of individuals organized in groups that leads them to “…imagine, experiment with and promote alternative ways of doing, organizing, framing and knowing” (Hexaltine et al., 2018, p.14). “Alternative” is a key component of this notion: its importance lies particularly on the acceptance and legitimization of plural ways of combining meaning, vision and imagination with cognitive resources, technologies and the configuration and organization of initiatives leading to change. Change and alternative, taken together, means that it is valid to include value-oriented purpose as a constitutive part of SI.

3.3. There are “ambitious SI” and “modest SI”

Incremental and radical are key alternative aspects of innovation. How do they appear in the case of SI? Incremental SI provide new ways of meeting social requirements more effectively and efficiently, while radical or disruptive SI are characterized by “a system-level change”, including change in power relations and alterations in social hierarchies (Turker and Vural, 2017). The aims of SI may be modest, like grass-root innovation involving a small community with specific challenges that probably will not trespass their boundaries. They can as well be extremely ambitious and seen as an alternative to the neoliberal vision by favoring solidarity over individualism, integration over separation, and collaboration over division (Klein, 2013, p.11). The frontiers between modest and ambitious SI is porous, though, because solidarity, integration and collaboration are present in both. This porosity is patient when looking into SI with the lenses of human and sustainable development; also when analyzing the role of knowledge, that goes from addressing “undone science” (Hess, 2007) by radically changing research agendas to addressing a concrete and delimited problem sufficiently the specific marginalized group. The point is that ambition is needed to build the conditions required by modest initiatives to survive and scale up; in turn, without the persistence of such modest experiences, the ambitious overarching goals will fail. So, perhaps, besides porosity at the frontiers between different types of SI, we can think of a dialectical relationship between modest and ambitious SI. Universities may participate in both, reinforcing them, through disciplinary or interdisciplinary research addressing specific social problems and by fostering changes at system level, like transforming the academic research system to reward social concerns or to open room for the participation of non-academics in the definition of research agendas.

3.4. Two key features of several characterizations of SI

Two features, present in several characterizations of SI, are particularly telling for re-thinking development and the role that advanced knowledge may play there. The first feature has to do with the characterization of SI not only as an outcome but also as a process (for instance, Hexaltine et al., 2016). The meaning of “process” regarding SI has mainly to do with social participation in the definition of the problems and the intended solutions, as well as getting people involved with the building of the solutions. In this sense, SI resonates with Ostrom’s (1996) concept of co-production. The second feature emphasizes the transformation of social relations and people’s empowerment, aiming at changing power structures through processes of awareness, capacity building and increased participation (Andersen and Siim, 2003). This second feature is obviously important for a development process understood as enhancing the capacity of people to lead lives they have reasons to value. It is equally important for advanced knowledge production aimed at contributing to the solution of social pressing problems, from general and global ones, like climate change, to local ones concerning, for example, health, housing, transportation or conviviality.

3.5. Some dangers and shortcomings related to the concept of SI

From the perspective of this paper, a first danger is “bowling alone” with SI, putting aside other theoretical approaches. National Systems of Innovation for instance, particularly from the vintage of the “Aalborg school” (Lundvall, 1992), is a useful tool to bring together development concerns and social processes of learning, even though it has not been so far too much involved with SI (Rao-Nicholson et al., 2017). The concept of deep transitions (Schot and Kanger, 2018) as well as the Multi-Level Perspective on sustainability transitions (Geels, 2010) help grasping the dynamic of innovations intertwined with societal transformations. SI should be creatively and productively integrated into these approaches: all ingredients are there, directionality of innovations, user-producer interactions, feedback between different levels of action, social and power relations. A second danger stems from the preeminence the concept of SI has acquired, which can foster a trend towards presenting anything as SI, liquefying its meaning and distorting, instead of enriching, the problems under scrutiny. Both shortcomings may reinforce each other, carrying the “…risk that SI can become packaged as part of the pervasive language of ‘best practice’ that can be applied anywhere in the world” (Moalaert et al., 2013b, p.18). There is also the danger of overlooking a main difficulty, current individualism; it is present everywhere, in academia, in enterprises, in the arts, even in co-operative undertakings; it threatens the very heart of the identity of SI, the collective dimension. Individualism goes well with the New Public Management emphasis in measuring, auditing, comparing, competing, excelling in a short and predetermined period. Disregard of this disruptive trend leads to what can be termed “fast SI”, that is, processes that lack the capacity to put at bay individualism. On the contrary, “slow SI” may be an expression able to highlight the importance of what Ostrom (1996) stresses so forcefully: collective action needs time to build trust among quite diverse participants, shared trust being one of the very seeds of SI. Universities have been pushed towards being machines of individualist behavior where speed in production is a hallmark of success. It is clear that “knowledge-based SI” cannot flourish without redressing this trend and requires a quite ambitious SI to succeed.

All this said, is still SI a valid notion? Criticism in this case does not lead to dismissing the concept: on the contrary, it is a useful “umbrella concept” for alternative ways to look into problems and to search for solutions, including the processes for building them. As such, it will be used in the sequel, with particular attention paid to inclusive and frugal innovations seen as relevant types of SI.

4. In search of alternatives

When considering only one of the two fundamental challenges of decreasing sustainability and increasing inequality, solutions could appear not exceedingly difficult. For example, if sustainability is privileged, the old recipe of zero growth could be envisaged. That would be ethically and politically doomed; it would imply “freezing” the actual landscape of inequality and, particularly, of extreme poverty. Recommending a combination of zero growth and very high redistribution could contest such argument; leaving aside the political feasibility of such alternative, it is doubtful that it would satisfy the
majority of people. What many want is not the consumption possibilities of the privileged 1% but, for example, the best health services available today that will be better tomorrow. Valuable ends like those will probably remain a strong driver of politically organized demands. Meeting them requires social and distributional policies, of course, but also innovation and expanding productive capabilities.

Those who have barely escaped from extreme poverty during the last decades and the many more who expect to improve their material conditions of life cannot be ignored by any type of political regime. A very important though also very partial change has taken place concerning one of the two fundamental challenges. Income inequality in almost every country has been rising, but at different rates. Nevertheless, the decrease of abject poverty in some regions –particularly those with such large populations as China and India– tends to reduce global income inequality. In turn, the environmental cost of such process is far from negligible.

Relevant facts and dominant trends show that a main tension appears between production and protection. Feasible and desirable alternatives require producing (much) better goods and services for more people with (much) less environmental costs. This defines the aim of a type of innovation that may be termed inclusive and frugal innovation. These are two defining and intertwined characteristics of innovation aiming to back Sustainable Human Development. Inclusiveness aims at solving problems of people left behind, be it because their problems have not been tackled –mainly due to weak or non-existent market incentives–, or because the way in which similar problems have been solved, related to food, shelter, sanitation, etc., are not adequate for their conditions. Frugality aims precisely to heterodoxy in problem-solving, thus providing high-quality solutions affordable in every respect to people that were excluded from solutions already available. Frugality aims as well at environmental sustainability and in this sense it is worth pursuing in every situation. If inclusive innovation is scarcely frugal, it will not back Sustainable Development and, in the more or less long run, it will not be really inclusive either. If frugal innovation is not inclusive, it will not back Human Development.

The characterization of inclusive and frugal innovation shows by itself that its knowledge base is not necessarily smaller or less complex than innovation for economic competitiveness, the type usually privileged by innovation policies. On the contrary: producing better for the many with less environmental and other costs will need, more than in any instance of the past, advanced research in every area of knowledge.

It is asserted that a great challenge for biotechnology is to enable the production of larger and better biomass with less use of natural resources; the expansion of biotechnology related with industry and agriculture could be greatly fostered by contributing to the struggle against climatic change (Tylecote, 2019).

Inclusive and frugal innovation must be technological and institutional. It needs to become “knowledge-based SI”, opening new paths in science and technology at the same time than in economic and political relations as well as in values; individualism and consumerism block roads towards Sustainable Human Development.

Who can be the collective actors or agents of a shift in knowledge production, technology, social relations and values that enlarges spaces for new types of innovation? Surely many. Among them it will be necessary to count with highly educated and socially committed people who expect to live a long future and know how problematic it can be. We are back at universities and, above all, to university students; their technical and ethical education will be of paramount importance. Priorities in knowledge generation and use tomorrow will be to a certain extent shaped by the aspirations forged today by young people with the best opportunities to learn in creative contexts. Consequently, the battle for the soul of universities is a crucial issue for widening or narrowing the possibilities of socially committed innovation.

Universities in general and particularly relatively large public universities are always heterogeneous and contradictory organizations. Rather than one single community of interests and values, universities are complicated mixtures of different communities with changing power and specific relations with external actors. Perhaps today the most relevant universities are in some sense different combinations of the Humboldtian and the entrepreneurial models. The developmental university (Arocena et al., 2018) is a normative ideal and an ideal-type of factual character, a la Weber, characterized by its contribution to Sustainable Human Development and, consequently, to inclusive and frugal innovation. It is akin to other notions as the “engaged” or “civic” university (Weerts and Sandmann, 2008; Benneworth, 2013). Such universities need to pursue “engaged scholarship” (Van de Ven, 2007, p.9), a participative form of research that combines the perspectives and kinds of knowledge of different stakeholders in order to study complex problems.

Expanding the developmental and engaged traits of universities depends surely on internal dynamics, but probably more so on external dynamics, given that articulation with non-academic actors is one of their constitutive traits. That has to be considered in a wider context to which we now turn.

5. Systems and levels in transitions

A synchronic framework for considering the context in which universities act is that of National Systems of Innovation (NSI) when looked at from the point of view of power. Its guiding idea is that innovation is the result of social processes, which are in general interactive, distributed and only effective if systemic. The original conceptualization of NSI (Freeman, 1987; Lundvall, 1992; Nelson, 1993) aimed at promoting heterodox alternatives for “catching-up” with the already highly industrialized countries. Japan first, and Korea and Taiwan later, were the examples that illustrated the approach (Lee, 2013). Its “national” dimension recognized the importance of history, culture, political systems, as well as natural resources endowments and economic structure, emphasizing thus the differences between countries. Looking at NSI from the South, it is an ex post concept in highly industrialized countries that refers to really existing processes of innovative systemic behaviors, while it is an ex ante concept in peripheral countries where innovation systems were postulated as necessary rather than actually observed (Arocena and Sutz, 2000).

NSI may be considered as the set of actors and organizations, and the links between them, as well as related policies, rules, norms, habits and beliefs, that in a given nation have main roles in technological innovation. Several years before the emergence of the NSI conceptualization, Sabato and Botana (1968) argued that for knowledge to play a role in development, the systemic articulation of the productive structure, the state, and the scientific and technological infrastructure was necessary. Those actors and their relationships came to be known as the “Sabato triangle” and are seen here as the nuclear triangle of a given NSI. In such triangle, each vertex is not a unitary actor. Sabato and Botana call “intra-relations” those that articulate the actors that live together in each vertex, with its different interests. Each vertex is, then, a space of conflict where power relations influence what interests prevail. Fig. 1 depicts this idea; dotted circles refer to emergent alternatives to institutionalized and dominant traits.

The possibilities for the expansion of inclusive and frugal types of innovation depend on the strength of the NSI and on the distribution of power inside it. The productive “vertex” of the nuclear triangle is the principal site of economic power in the NSI. The state “vertex” concentrates political and military power. In South Korea and Taiwan the side that connects those two vertex was given concrete content by the coalition of the commanding heights of big firms and of the state which led the expansion of national power and its internal distribution against workers by authoritarian means (Evans, 1995).

The third “vertex”, representing the scientific and technological infrastructure, is the main knowledge base of the NSI. Universities are a fundamental component of it. The level and nature of the interactions...
of this last vertex with the other two are highly dependent on dominant economic and political interests but also on prevailing ideologies about the role of technology and the national capabilities for working in such area. Nelson (1993) stressed the relevance of “techno nationalism” as a lever of technological upgrading in the catching up orientated NSI of East Asia. The evolution of Nordic NSI in the long-run has been deeply shaped by a normative commitment with welfare policies (Mjoset, 2016). In the South, a relevant trait of innovation processes is the self-defeating lack of confidence on national capabilities for doing new and efficient things in the technological realm, the “…vicious circle of dependency - lack of innovation - inferiority feeling (Sabato and Botana, 1968, p.9; our translation). Building such confidence and connecting it with social policies require knowledge-based empowerment of subordinated actors. This is hampered because such actors are not really part of the Innovation System, since they are not involved in the orientation of knowledge generation and the ways of using knowledge.

The approach to NSI proposed by the Aalborg school indicates that when advanced knowledge becomes the principal basis of power relations, learning becomes a decisive social process, in such measure that it is better to speak of Learning and Innovation Systems. The increasing complexity and influence of advanced knowledge destabilize institutions, habits, and especially working conditions; coping with ensuing problems requires generalizing advanced and permanent learning connected with work and innovation. Such aim may become evident particularly for subordinated groups for which lack of learning opportunities means belonging to the “precariat” as described by Standing (2011), leading to live near exclusion. Consequently, a social demand for advanced learning may rise, strengthening ties between some popular actors and (some sectors of) universities. That may, at the same time, enhance the developmental role of universities and the incorporation of new collective agents to innovation systems, which could, in the long-run, come near to deserve the name of Inclusive and Frugal Learning and Innovation Systems.

To explore possible evolutions of Innovation Systems a diachronic conceptualization is required. For that, the Multi-Level Perspective (Geels, 2010; Geels and Schot, 2010) is useful. It takes into account micro, meso and macro levels considering, respectively, niches, socio-technical regimes and (general) landscapes. Changes are needed at the three levels and a “Deep Transition” can only take place if the general landscape is transformed.

Socio-technical regimes are “the locus of established practices and associated rules that stabilize existing” ways (Geels, 2011, p.21) of carrying on functions as for example transport, energy or food production. The transition from one of such regimes to another is a deep process because changes take place at technological, economic, regulatory and cultural dimensions shaped by power. Such changes can be seen as taking place in the NSI “macro” framework and specifically at the “meso” level of the corresponding Sectoral System of Innovation (Malerba, 2002). Conversely, the Multi-Level Perspective offers a conceptual framework for analyzing how NSI evolve.

The micro level –niches– of the Multi-Level Perspective is very interesting, especially so in present circumstances where dominant power configurations do not favor social innovation and tend to block deep transitions. Some niches are “small” relatively protected spaces; there, heterodox innovations, built-up with a relevant role of users, can appear and even mature without being destroyed by early exposure to the full strength of powers that be. They may host “subversive cultures” that challenge dominant visions and values. (Smith and Stirling, 2018) Niches are akin to what Mann (1986) calls interstices, referring to social spaces not completely covered by institutionalized power relations and potential sites where new relations can emerge. In his view, the drives to institutionalization consolidate dominant configurations of power, but they always leave outside some small spaces where new power relations can be fostered, sometimes leading to the interstitial emergence of alternative configuration that can influence meso and even
The whole system transition to sustainability could be the result of gradual continuous processes that lead to discontinuous outcomes (Mc Meeking et al., 2019). Inclusive and frugal innovation can grow for example in interactive learning spaces (Arocena and Sutz, 2002). They are niches where different actors cooperate in the search of innovation for solving some collective problem by pooling their different types of knowledge. If the process is mildly successful, every actor learns and an interstitial network emerges. If it points to an alternative style of innovation, it can be a germ of change at the related socio-technical regime. If it is backed by some “meso” level actors (for example a socially engaged university) and protected by some “maco” level actors (as a government with innovation policies connected with social issues), the network can become a source of systematic innovation and influence similar processes in adjacent niches in the same regime or beyond. Examples can be found in connection with every type of socio-technical regime (agriculture, energy, communications, health, etc.).

It is said that presently dominant orientations for research and innovation are near a crisis (Soete, 2019). The interstitial emergence of alternative types of innovation can scale up to transitions at the level of socio-technical regimes, if at least two conditions are met: first, relevant collective agents acting in those regimes get involved in the transitions; second, scaling up is backed by progressive governments with strong and non-conventional policies. In such case, transitions in several socio-technical regimes may accelerate and influence each other. Changes may reach the macro level of the NSI as an institutionalized configuration of innovation interactions and aims. If strategies inspired by a transformative conception of development are implemented, then Inclusive and Frugal National Systems of Learning and Innovation may become at least a partial description of the general landscape. Fig. 2 tries to capture the dynamics of change just described.

6. Social innovation in scarcity conditions

Today the set of highly industrialized countries called the North is the site of the capitalist knowledge society and the Rest is called the (global) South. The peripheral condition of the Rest stems from its technological weakness and the closely connected subordination to central countries. As half a century ago, the vertexes of the Sabato triangle in most peripheral countries are less related between them than with the “triangles” of central countries (Sabato and Botana, 1968). Dependence goes from technology and economics to politics and beyond, including ideology.

Social innovation in the South needs to take into account what classic theorists of development in the Third World called “the specificity of the peripheral condition”. It can be conjectured that: (i) fostering inclusive and frugal innovation stemming from specific capabilities for solving problems differently in peripheral countries may become a tool for Human and Sustainable Development; (ii) said capabilities are upgraded by combining them with advanced knowledge; (iii) among the obstacles to overcome for advancing in such direction, ideological dependence is a main one.

Demand for innovation backed with purchasing power is strong in the North. That is not the rule in the South where such demand is weak and mainly addressed to external producers located in central countries (Arocena and Sutz, 2010). Pressing demands for innovation, backed by social actors, may though emerge, frequently in connection with problems of more or less deprived sectors; they are demands for inclusive innovation. When such innovations materialize, they are also comparatively frugal, for scarcity -in terms of money, infrastructures or operating skills– leads to different heuristics for problem-solving that tend to use less natural resources besides widening the access of people to the solutions found. (Srinivas and Sutz, 2008)

Often frugal innovations are associated with less technologically sophisticated solutions to given problems, but it does not need to be so. If the aim of such innovations is to foster sustainability without leaving behind poor people then the potential role of advanced knowledge is quite evident. Problems often not even recognized as such must be solved in ways that frequently differ from standard ones. To elaborate new products and services that are at least as good as known ones, but cheaper and less consuming in terms of natural resources, demands in general not less but more research than business as usual. It demands also changes in research agendas, expanding its scope, setting new priorities, altering evaluation in order to effectively taking them into account.

Innovating in scarcity conditions is at odds with innovation policies aiming at catching up, mimicked on the models elaborated where abundance is the rule. Fostering innovating in scarcity conditions as a general and efficient strategy in the South confronts several obstacles. One is the assumption that “good solutions” are those provided by the North. They set the standard in almost all realms of technological problems, as well as related research and educational issues. This leads to “voluntary underdevelopment” (Freeman, 1992, p.48), when a country decides systematically to import solutions that their own researchers and innovators could build up, with closer attention to the context and often in a cheaper way. Freeman’s expression characterizes several aspects of the policies implemented in what could have been an exceptionally favorable context for development in South America during the period of economic bonanza plus progressive politics that has almost withered away. Examples include the copy of university models and academic evaluation systems from the North, that in such context are strongly contested and that in the South simply consolidate underdevelopment. Such models and systems separate universities from inclusive and frugal innovation based on higher education and world level research.

Innovation in the South will keep being weak if it does not include a remarkable amount of socially committed innovation. This is required to cope with collective problems and to legitimize research and innovation as well as to show that it can be endogenous. Progress in this direction, particularly by defeating “voluntary underdevelopment” through innovating in scarcity conditions, can open new possibilities for sustainability and inclusion, South and North.

Universities in the South should and could be hubs for social innovation in scarcity conditions. That means cooperating with other actors, detecting niches and often sheltering them, fostering their conversion into interactive learning spaces, promoting the connections between such spaces as a route towards the interstitial emergence of strong variants of innovation. That can be especially the case when universities keep more or less alive a tradition of social commitment and a considerable degree of autonomy, as several public universities of Latin America do. Autonomy opens space for quite different trajectories, shaped to a significant extent by the prevailing material and ideal interests of teachers, researchers and students. Communities of researchers related mainly with their international colleagues defend the Humboldtian university, often understanding autonomy as akin to autarchy of the ivory tower. University people that see Higher Education as above all an opportunity for social mobility consider autonomy mainly as their opportunity to allow or forbid professional activities. Some networks of researchers and graduates working in highly economically rewarding knowledge-based areas may foster the model of the entrepreneurial university. Such alternatives do little to enhance the contribution of universities to social innovation. The last requires a “connected autonomy”, meaning that the university is a self-oriented and non-subordinated partner in the Innovation System, playing an active role in its nuclear triangle acting at micro, meso and macro level.

Connected autonomy has usually a fragile internal support, stemming mainly from the social commitment of some groups of teachers and researchers, eventually multiplied by the more or less transient but sometimes decisive energy of student movements. Such autonomy can be strong in the long range only if connections are fostered not only by academic groups but also and mainly by external actors, particularly...
least-advantaged sectors, whose learning and innovation needs can be best served by working with universities that are not subordinated to powers that be. An analysis of the requisites for mobilizing universities into tackling sustainability challenges (Hart et al., 2016) states: “In the absence of productive stakeholder partnerships – challenging as they are to build and maintain – our academic efforts will be misaligned, misallocated, and mistaken”. Connected autonomy requires incorporating new actors to Innovation Systems.

Such incorporation stems, for example, from promoting what can be called “inclusive mini Sabato triangles”: institutionalized networks that connect a public organism, a university, and a productive actor with weak knowledge power. The last can be a set of micro and small firms, or a trade union, or a cooperative, or a movement of small ecological producers. The aim of “inclusive mini Sabato triangles” is to become interactive learning spaces able to bridge the gap between advanced knowledge and popular actors.

Bridging such gap has as a necessary condition the generalization of advanced and permanent education connected with creative work and civic action. This is a difficult process that, partially but significantly, is taking place in the North. In the South it is at best at its initial stages; universities are indispensable actors for fostering it; they can do that not by themselves but in cooperation with other actors. Now, if such process does not include the wide majorities, it will deepen the learning divide between those who access Higher Education with success and those who are not able to do it. Partners of universities in the main institutional innovation of generalizing advanced education must...
include popular actors, thus providing another avenue for their incorporation to Learning and Innovation Systems in ways that promote their inclusive and sustainable dimensions.

7. Lessons from an experience

The University of the Republic (UR) in Uruguay has a telling experience concerning social innovation. Our participation in its academic and decision-making processes suggested the choice of the following cases; for all of them specific references are given. UR concentrates 80% of the university students as well as 80% of all knowledge production. It has several traits stemming from the Latin American university reform movement, particularly its institutional autonomy and a governance system where students, teachers and alumni are represented.

7.1. Introducing social innovation traits in “canonical” research

What traits should be present in University research policies in order to open room for social innovation? At least two, as suggested by insights provided by Dawson and Daniel (2010) and Edwards-Schachter and Wallace (2017): (i) aiming to the betterment of some social situation and (ii) promoting the participation of new actors, particularly those that usually are at arms-length from academic knowledge.

Changes over time in a university research policy usually follow a “canonical” path, meaning that research is fostered as it is done everywhere in academia. However, social innovations may be fostered even in canonical programs. An example is given by the calls for R&D projects. The first calls of this type organized by the UR Research Council allowed only faculty staff to present proposals. After, the co-production of knowledge by people of different organizations started to be valued as part of the social role of the university. Accordingly, when two main researchers presented a proposal, one was allowed to belong to any organization that would bring deepness, feasibility, field knowledge or other desirable characteristics to the research. Another example of this sort is a program designed to link academic research with production problems, canonically termed “university-enterprise relations”. Social innovation traits were introduced by considering that production actors are not only enterprises but also trade unions, cooperatives and some social movements. Counterparts of research projects under this program included different actors, some of them particularly weak and in need of academic support to get stronger, like the just born organization of the domestic workers. (Cohanoff et al., 2020)

Research Program’s management can also incorporate social innovation traits. When the UR Research Council launched a Students Research Program, the aim was to allow a new actor -team of students-the right to propose research projects. The trend towards using such teams to foster their adviser’s projects led to making explicit that students should build by themselves their research problems, and including this aspect in the evaluation process. Granting true participation is indeed a social innovation trait. More than five hundred students participate each year in the Program, started in 2008. Besides achieving several academic successes, like the discovery of unknown mega fauna fossils, an impressive number of students’ projects addressed social problems. (Sclavo and Waiter, 2014)

7.2. The building of a research dialog between the university and public enterprises

In Uruguay, telecommunications, electricity generation, water distribution and oil refining continue to be activities in the hand of public enterprises. They have not been a vehicle for endogenous technological development, though, given that turnkey purchase of technological solutions has been the norm. However, the daily work of such strategic and complex enterprises, with hundreds of technicians, posed important challenges.

In 2008, with the favorable conjuncture of a closer relationship than before between the UR and the government, the oil refining enterprise ANCAP (for its Spanish acronym) sought the collaboration of UR in R&D. A joint Program “ANCAP-UR” was launched where technical staff of the enterprise presented problems to the research community, after which UR organized a call for projects and the process of academic evaluation. ANCAP would then select among the academically approved projects the ones for which it would provide funds. Throughout the years, ANCAP technicians increasingly worked in posing problems that led to research questions and got involved in the projects’ development, thus favoring the appropriation of results. Half of the supported projects corresponded to diverse discipline within engineering, but other disciplines were present as well, from biology to psychology and sociology. (Cohanoff and Mederos. 2020)

The “ANCAP-UR model” became a reference; it fosters cooperation of different actors for solving problems by mobilizing and co-producing local knowledge. A related successful experience is now taking place with the energy public enterprise. Another one just started with UNICEF focusing on violence against children and teenagers; it is a promising experience of inclusive innovation.

7.3. Fostering quality research in weak research sectors as a duty of research policy

Comparatively weak research sectors may become stuck in their weakness if left alone. To countervail this trend, a new program was put in place in 2008, “Fostering quality research in the whole university”. It received a relatively important budget, even though research strong sectors are far from obtaining all they need. The program innovates by tailoring the concept of “research excellence” to each situation; it is also highly mobilizing because it promotes reflexivity, fosters medium-term planning, prompts change, and involves collective action. It has also external impacts: by fostering interdisciplinary research in medical physics, for example, it supported at an adequate level a new professional career for which there is a huge need in Uruguay.

The Program shows some concrete improvements in different areas. To our knowledge it is an “innovation under the sun”; it can be considered a social innovation aimed at enhancing the research ecosystem. Coping with social problems requires not only interdisciplinary work but also “dialogues between equals” in research capacities: if important asymmetries are present, the strong disciplines will overpower the weak ones. Thus, this Program builds the possibility of generalizing rich and until now unforeseen interdisciplinary encounters, enhancing the capacity of the University to become a better partner in social change. (Ardanche et al., 2014)

7.4. Promoting knowledge and innovation for social inclusion: a way of achieving direct commitment and context awareness

The Program “Research and Innovation for Social Inclusion” started at UR in 2008 on a regular biennial basis to foster contextualized research and innovation directly linked to problems that limit social inclusion. An antecedent was a small pilot organized in 2003, when the effects of the 2002 economic crisis showed with unprecedented cruelty the vulnerability of important segments of the population. The Program provides a framework for the direct participation of the university in the fight against social exclusion. Researchers need to include in their proposals: (i) the identification of a social inclusion problem; (ii) an assessment of the potential demand for solutions from the concerned population and related non-academic actors; (iii) an assessment of the possible involvement of those in a position to implement the solution (if obtained) and open the way to its effective use.

The Program has several innovative features: one of them is the intermediary role between problems and faculty played by the Academic Unit of the University Research Council (AU). Perhaps the
two more difficult but essential parts of this intermediary role relate to the identification and the “translation” stage. How do actors express the problems they face? Does solving such problems require new knowledge? If yes, how to present the problems so researchers may recognize them as addressable? A general lesson learned is that the more direct the relationship between the problem bearer and the researchers, the easier the implementation of the research results. This is particularly evident when the former belongs to the medical profession. (Alzugaray et al., 2012)

The 2018 edition of the Program focused on the Integrated National System of Care. This is a recently created tool for providing attention backed by public funds to children under three years, elderly with different types of lack of autonomy, and disabled persons. A year of joint work between officials of the Care Systems and the AU led to the definition of four main aspects to be considered: measuring the need for care, financial sustainability of the care system, how to care those who take care, and assistive technologies. Researchers of various knowledge backgrounds presented proposals. (Sutz et al., 2019)

8. Recapitulation

The experience described in the previous section tends to confirm the elaboration presented before. It shows that a university that combines a significant degree of autonomy for orienting its activities with a wide array of connections with different institutions and actors can contribute to social innovation. Difficulties have internal and external sources because of the different expectations concerning universities. Students mainly expect to advance as quickly as possible in increasingly specialized professional careers. Full time academics expect to advance in the international recognition of their contributions to their disciplinary fields. Both are natural and legitimate aspirations; the challenge is to show that a strong social commitment of universities can improve education, technically and ethically, as well as enrich research and build political support for it. This has just happened in Uruguay when the COVID-19 huge challenge started. A self-organized movement to sterilizing procedures that were clear examples of innovations in scarcity conditions: they not only provide what was unavailable in the world market, but they make cheaper artifacts by using different approaches. Research received a societal attention never seen in the country before.

The decisive challenges of inequality and lack of sustainability will probably promote further this type of commitment. Both demand a reorientation of Learning and Innovation Systems towards frugality and inclusiveness. This requires paying attention to niches as interstices where alternatives can grow, to socio-technical regimes where partial but decisive transitions can take place, and to the whole System as the proper reference for long-term strategies. In all that, universities, as main sites for combining learning and knowledge generation, can be relevant actors.

Difficulties are compounded in the South by the peripheral condition and the subordination to the North, particularly in ideological terms. The inspiration of Hirschman (1958) leads to look for neglected and specific resources that can be put to work for developmental purposes; a paramount example are the capabilities for innovating in scarcity conditions that, although usually not evident, are abundant in many regions of the South. Detecting them and fostering their connection with higher education and high-level research is the core of a strategy for Sustainable Human Development where universities can and must play a relevant role. When Humankind is in bad need of a deep transformation, it is an opportunity to address the challenges ahead by learning from those who have been obliged to learn how to innovate in scarcity conditions.

The approach sketched in this paper stresses the relevance of social innovation for bridging the gap between popular collective actors and advanced knowledge, a main obstacle for the commitment of universities to foster sustainability and equality.

Disclosure statement

No potential conflict of interest was reported by the authors.

Funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Acknowledgement

The authors fully appreciate the insightful comments by two anonymous reviewers.

References

Alzugaray, S., Mederos, L., Sutz, J., 2012. Building Bridges: social Inclusion Problems as Research and Innovation Issues. Review of Policy Research 29 (6), 776-796.

Andersen, J., Sim, B., 2003. Introduction. In: Andersen, J., Sim, B. (Eds.), The Politics of Inclusion and Empowerment - Gender, Class and Citizenship. Palgrave, New York, pp. 1-18. https://doi.org/10.1057/9781403990013.

Archange, M., Gotli, M., Tomassini, C., 2014. De lo normativo a la teoría y de la teoría al laboratorio: políticas universitarias para el fortalecimiento institucional de la calidad en investigación. Coord In: Blanco, M., Sutz, J. (Eds.), Veinte Años De Políticas De Investigación En La Universidad De La República. Trilce, Montevideo, pp. 107-128.

Arocena, R., Goransson, B., Sutz, J., 2018. Developmental Universities in Inclusive Innovation Systems. Alternatives for Knowledge Democratization in the Global South. Palgrave, New York. https://doi.org/10.1007/978-3-319-64152-2.

Arocena, R., Sutz, J., 2009. Looking at National Systems of Innovation from the South. Industry and Innovation 7, 55-75.

Arocena, R., Sutz, J., 2002. Innovation Systems and Developing Countries. DRUID (Danish Research Unit for Industrial Dynamics) Working Paper No. 02-05.

Arocena, R., Sutz, J., 2010. Weak knowledge demand in the South, learning divides and innovation policies. Science and Public Policy 37, 571-582.

Avelino, F., Wittmayer, J.M., Pel, B., Weaver, P., Dumitru, A., Haxeltine, A., Kemp, R., Jørgensen, M.S., Bauler, T., Ruijksink, S., O’Riordan, T., 2019. Transformative social innovation and (dis)empowerment. Technology Forecasting Social Change 145, 195-206.

Bayou, B.B., Chaminade, C., Goransson, B., 2020. Unpacking the role of universities in the emergence, development and impact of social innovations – A systematic review of the literature. Technology Forecasting Social Change 155.

Bennworth, P., 2013. University engagement with socially excluded communities. Towards the idea of ‘the engaged university’. In: Bennworth, P. (Ed.), University Engagement With Socially Excluded Communities. Springer, Dordrecht, pp. 3-31. https://doi.org/10.1007/978-94-007-4875-6.

Bound, K., Thornton, I., 2012. Our Frugal future: Lessons from India’s Innovation System. https://www.nesta.org.uk/sites/default/files/our_frugal_future.pdf.

Cajalba-Santana, G., 2014. Social innovation: moving the field forward. A conceptual framework. Technology Forecasting Social Change 82, 42–51.

Cohonoff, C., Mederos, L., Simon, L., 2014. La universidad conectada y sus desafíos. Coord In: Blanco, M., Sutz, J. (Eds.), Veinte Años De Políticas De Investigación En La Universidad De La República. Trilce, Montevideo, pp. 85-106.

Cohonoff, C., Mederos, L., 2020. Espacios interactivos de aprendizaje y circuitos innovativos en contextos periféricos. Análisis de la vinculación entre academia y una empresa pública en Uruguay, 2008-2018. Revista Iberoamericana de Ciencia, Tecnología y Sociedad 15 (44), 221–252 N°.

Dawson, P., Daniel, L., 2010. Understanding social innovation: a provisional framework. Int. J. Technology Management 51 (1), 9–21.

Edwards-Schachter, M., Wallace, M., 2017. Shaken, but not stirred: sixty years of defining social innovation. Technology Forecasting Social Change 119, 64–79.

Evans, P., 1995. Embedded Autonomy States and Industrial Transformation. Princeton University Press, Princeton. https://doi.org/10.1515/9781400821723.

Freeman, Ch. 1987. Technology policy and economic performance - Lessons from Japan. London: Pinter Publishers.

Freeman, Ch. 1992. Science and Economy at the National Level. In: Freeman, Ch (Ed.), The Economics of Hope. Pinter Publishers, London, pp. 31–49. https://doi.org/10.1080/081092508269142.

Geels, F., 2011. The multi-level perspective on sustainability transitions: responses to seven criticisms. Environmental Innovation and Societal Transitions 1, 24–40.

Geels, F., 2010. Ontologies, socio-technical transitions to sustainability, and the multi-level perspective. Res Policy 39. 495-510.

Geels, F., Schot, J., 2010. The dynamics of socio-technical transitions. A socio-technical perspective. In: Grin, J., Rotmans, J., Schot, J. (Eds.), Transitions to Sustainable Development New Directions in the Study of Long Term Transformative Change. Routledge, New York, pp. 11–101. https://doi.org/10.4324/9780203856598.

Gerth, H., Mills, W., 1958. From Max Weber. Oxford University Press. New York.

Hart, D.D., Buizer, J.L., Foley, J.A., Gilbert, L.E., Graumlich, L.J., Kapuscinski, A.R.,
Kramer, J., Pamer, D., Peart, D., Silka, L., 2016. Mobilizing the power of higher education to tackle the grand challenge of sustainability: lessons from novel initiatives. Elem Sci Anth 4 p. 000090. http://doi.org/10.12952/journal.elementa.000090.

Haxhine, A., Jørgensen, M., Pel, B., Dumiru, A., Avelino, F., Bauler, T., Lema, I., Chilvers, J., Cipolla, C., Dorland, J., Morten, E., Garido, S., René Kemp, R., Kunze, L., Longhurst, N., Pataki, G., Rach, S., Renema, J., Ruijsink, S., Straesser, T., Tawakol, D., Weaver, F., Wittmayer, J., 2016. On the Agency and Dynamics of Transformational Social Innovation. TRANSIT Working Paper # 7. http://www.transsocialinnovation.eu/content/original/Book%20covers/Local%20PDFs/242%20TRANSIT%20Working%20Paper_no_7_TSI%20Propositions_Haxhine%20et%20al.,
November 2016-A1251116.pdf.

Haxhine, A., Avelino, F., Wittmayer, J.M., Kunze, L., Longhurst, N., Dumiru, A., O’ Riordan, T., 2018. Conceptualizing the role of social innovation in sustainability transformations. In: Backhaus, J., Genus, A., Lorek, S., Vadovics, E., Wittmayer, JM (Eds.), Social Innovation and Sustainable Consumption. Research and Action for Societal Transformation. Routledge, New York, pp. 12–26. https://doi.org/10.4324/9781315201559.

Hess, D., 2007. Alternative Pathways in Science and Industry. Activism, Innovation, and the Environment in an Era of Globalization. Mass The MIT Press, Cambridge. https://doi.org/10.7551/mitpress/1206.001.0001.

Hirshman, A., 1958. The Strategy of Economic Development. Yale University Press, New Haven. https://doi.org/10.1007/978-1-937525-01-1.

Howsold, J., Kalelka, Ch., Schröder, A., and Zirngiebel, M. (eds.) Atlas of Social Innovation, 2nd Volume: A World of New Practices. München: oekom verlag.

Klein, J.L., 2013. Introduction: social innovation at the crossroads between science, economy and society. In: Moulaert, F., MacCallum, D., Mehンド, A., Hamdouch, A. (Eds.), The International Handbook On Social Innovation: Collective Action, Social Learning and Transdisciplinary Research. Edward Elgar, Cheltenham, pp. 9–12. https://doi.org/10.4395/rsp.v21i3.1225.

Lee, K., 2013. Schumpeterian Analysis of Economic Catch-up. Knowledge, Path-Creation, and the Middle-Income Trap. Cambridge University Press, UK. https://doi.org/10.1017/CBO9781107033724.

Lehoux, P., Miller, F.A., Williams-Jones, B., 2020. Anticipatory governance and moral imagination: methodological insights from a scenario-based public deliberation study. Technology Forecasting and Social Change 151, 102192.

Lundvall, B.A. (Ed.), 1992. National Systems of Innovation - Towards a Theory of Innovation and Interactive Learning. Pinter Publishers, London.

Malerba, F., 2002. Sectoral systems of innovation and production. Res Policy 31, 247–264.

Mann, M., 1986. The Sources of Social Power, Vol I: A History of Power from the Beginning to AD 1760 Cambridge University Press, Cambridge. https://doi.org/10.1017/CBO9780511570996.

Mc Meeking, A., Geels, F., Hodgson, M., 2019. Mapping the winds of whole system transitsocialinnovation.eu/content/original/Book%20covers/Local%20PDFs/242%20TRANSIT%20WorkingPaper_no_7_TSI%20Propositions_Haxhine%20et%20al.,
November 2016-A1251116.pdf.

Mehmood, A., Parra, C., 2013. Social innovation in an unsustainable world. In: Moulaert, F., MacCallum, D., Mehンド, A., Hamdouch, A. (Eds.), The International Handbook On Social Innovation: Collective Action, Social Learning and Transdisciplinary Research. Edward Elgar, Cheltenham, pp. 53–67.

Mjoest, L., 2015. The Nordic route to development. In: Reinert, E., Ghosh, J., Kattel, R. (Eds.), Handbook of Alternative Theories of Economic Development. Edward Elgar, Cheltenham, pp. 533–569.

Moulaert, F., MacCallum, D., Mehンド, A., Hamdouch, A., 2012a. General introduction: the return of social innovation as a scientific concept and a social practice. In: Moulaert, F., MacCallum, D., Mehンド, A., Hamdouch, A. (Eds.), The International Handbook On Social Innovation: Collective Action, Social Learning and Transdisciplinary Research. Edward Elgar, Cheltenham, pp. 1–9.

Moulaert, F., MacCallum, D., Hillier, J., 2013b. Social innovation: intuitions, precepts, concept, theory and practice. In: Moulaert, F., MacCallum, D., Mehンド, A., Hamdouch, A. (Eds.), The International Handbook On Social Innovation: Collective Action, Social Learning and Transdisciplinary Research. Edward Elgar, Cheltenham, pp. 13–25.

Mulgan, G. 2007. Social Innovation: What It Is, Why It Matters and How It Can Be Accelerated. Oxford Said Business School, Skoll Center for Social Entrepreneurship. Nelson, R., 1993. National Innovation Systems. Oxford University Press, New York. Ostrom, E., 1996. Crossing the Great Divide: co-production, Synergy, and Development. World Dev 24 (6), 1073–1087.

Rao-Nicholson, R., Vorley, T., Khan, Z., 2017. Social innovation in emerging economies: a National Systems of Innovation based approach. Technol Forecast Soc Change 121, 228–237.

Sabato, J., Botana, N., 1968. La ciencia y la tecnología en el desarrollo futuro de América Latina. Revista de la Integrazione 3, 15–36.

Schot, J., Kangen, L., 2018. Deep transitions: emergence, acceleration, stabilization and directionality. Res Policy 47 (6), 1045–1059.

Sclavo, A., Wairer, A., 2014. Los jóvenes y la investigación”. Coed In: Bianco, M., Sutz, J. (Eds.), Veinte Años De Políticas De Investigación En La Universidad De La República. Trilde, Montevideo, pp. 49–72.

Sen, A., 1999. Development As Freedom. Anchor Books, NY.

Smith, A., Stirling, A., 2018. Innovation, Sustainability and Democracy an Analysis of Grassroots Contributions. J.Self-Governance and Management Economics 6 (1), 64–97.

Soete, L., 2019. Science, technology and innovation studies at a crossroad: SPRU as case study. Res Policy 48 (4), 849–857.

Srinivas, S., Sutz, J., 2008. Developing countries and innovation. Searching for a new analytical approach. Technol Soc 30, 129–140.

Standing, G., 2011. The Precariat. The New Dangerous Class. Bloomsbury Academic, London. https://doi.org/10.5040/9781849664554.

Sutz, J., Tonnastini, C., Zehllos, C., Gotti, M., Rodales, M., 2019. Ten years of research and innovation for social inclusion in the Uruguayan public university: policy lessons learnt. In: Howaldt, J., Kalelka, Ch., Schröder, A., Zirngiebel, M. (Eds.), Atlas of Social Innovation, 2nd Volume: A World of New Practices. oekom verlag. München.

Turker, D., Vural, C.A., 2017. Embedding social innovation process into the institutional context: voids or supports. Technol Forecast Soc Change 119, 98–113.

Tylecote, A., 2019. Biotechnology as a new techno-economic paradigm that will help drive the world economy and mitigate climate change. Res Policy 48 (4), 858–868.

UNDP, 2019. Human Development Report 2019. Beyond income, Beyond averages, Beyond today: Inequalities in Human Development in the 21st Century. New York.

Van de Ven, A.H., 2007. Engaged Scholarship - A Guide For Organizational and Social Research. Oxford University Press, Oxford.

Weerts, D.J., Sandmann, L.R., 2008. Building a two-way street: challenges and opportunities for community engagement at research universities. Review of Higher Education 32 (1), 73–106.

Rodrigo Arcena and J. Sutz Technological Forecasting & Social Change 162 (2021) 120399

with Goransson, B. y Sutz, J. (2019): “Towards making research evaluation more compatible with development goals”, Science and Public Policy. 46 (April), 210–218.

(2018): “Power, innovation systems and development”, Innovation and Development, Volume 8, Issue 2, 271–285.

Judith Sutz Full Professor of Science, Technology, Innovation and Development and Academic Coordinator of the University Research Council, University of the Republic, Uruguay. Her work relates to the design and implementation of university research policies, with a focus on ways of building bridges between academic research and social concerns, and on promoting transformations of the academic reward system to foster that aim. Her latest book, with Rodrigo Arcena and Bo Goransson (2018) is “Developmental Universities in Inclusive Innovation Systems. Alternatives for Knowledge Democratization in the Global South”, Palgrave.

R. Arcena and J. Sutz

Technological Forecasting & Social Change 162 (2021) 120399

Power, innovation systems and development”, Innovation and Development, Volume 8, Issue 2, 271–285.

Judith Sutz Full Professor of Science, Technology, Innovation and Development and Academic Coordinator of the University Research Council, University of the Republic, Uruguay. Her work relates to the design and implementation of university research policies, with a focus on ways of building bridges between academic research and social concerns, and on promoting transformations of the academic reward system to foster that aim. Her latest book, with Rodrigo Arcena and Bo Goransson (2018) is “Developmental Universities in Inclusive Innovation Systems. Alternatives for Knowledge Democratization in the Global South”, Palgrave.