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Inequality and innovation as seen from the South

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Abstract

This article begins by contrasting different approaches to Science, Technology and Society (STS), and suggests that an interactionist model is best for understanding development issues. It then argues that in a perspective “from the South”, interactionism points as well toward adaptation of a national systems of innovation (NSI) approach and the need for a more careful analysis of the features of underdevelopment that are characteristic of specific countries in the age of globalization. Following a review of NSI theory, the article focuses on some relations between inequality, capabilities, and technical change, with comparisons between development trajectories in Scandinavia and the Southern Cone of the Americas. “Learning divides” are characterized as a core dimension of underdevelopment today. Historical comparisons suggest a distinction between proactive and reactive types of equality as important for development studies. A conclusion presents the search for “proactive equality” as a fundamental task for STS studies in underdeveloped contexts.

In the STS studies, there are two main approaches: a “European” tradition that focuses on the social factors shaping the generation of new science and technology outputs, and a [north] “American” tradition that focuses on the social consequences of such outputs [1] (p. 66). But another tradition defined by J.D. Bernal in his great work on social history of science [2] studies the interactions of scientific and technological practices with all social relations. This approach has a long if currently unappreciated history, especially in the South, where a remarkable example is provided by Latin American thinking of the 1960s and 1970s on the “science-technology-development-dependency” issues [3] (esp. Sec. III). This “third tradition” inspires our “innovation as seen from the South” approach that is briefly presented here. It aims to make a small contribution at the crossroads of innovation studies and development problems.
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1. Underdevelopment today

Science and technology foster processes of destabilization and change. The ever-increasing economic relevance of knowledge and the immediacy of its applications fuel innovation. The concentration of knowledge resources and innovation capabilities in some groups and regions leads to the self-reproduction of social asymmetries. Production grows and becomes more diversified, as does inequality. Innovation implies “creative destruction,” as Joseph Schumpeter [4] put it, but for many people what is lost is more important than what is gained. In the natural and social environments in which they live, what prevails is “destructive innovation”. With regard to products, machines, jobs, and skills, “creation” for some people often means “destruction” for others.

Today we are witnessing an acceleration of the process of inclusion/exclusion, and even the growing irreversibility of the latter. Almost twenty years ago, Fernando Henrique Cardoso observed:

Part of what has been known as the Third World has become a wide “Fourth” World of need, hunger and despair. The case is not any more that of a periphery tied to a capitalist centre by classic dependency relationships. We are witnessing the dramatic situation of countries that failed in occupying the slightest interstice in the world market and which exploitation has ceased to be in the center’s interest [5] (p. 444).

At the end of the 1990s, in his exhaustive study of “the information age”, Manuel Castells reached similar conclusions [6].

The predominant counter-vision presents globalization as a process from which every place and person will eventually benefit. Exclusionary trends were initially explained as caused by the incomplete application of necessary structural changes. More recently, the negative implications of techno-economic changes are being accepted in international circles, and social policies are once again recommended as responses to the negative side effects of globalization. In the midst of uncertainty, destabilization, and change brought about by knowledge-based and innovation-driven economies, debates tend to be polarized between “apocalypse” and “integration”, to adopt terms from Umberto Eco [7].

Apocalyptic visions are hard to avoid, at least in the South, and not only there. Extreme poverty, dramatic demographic changes due to massive migrations, new forms of violence and urban insecurity, monetary transfers, the great difficulties of coping with open or functional illiteracy—these are just some of the challenges to all positive interpretations of prevailing trends.

Intellectual integration is another attractive option. Today the major criterion of success is determined by international benchmarking. Dominant ideas are based on the material success of advanced capitalism. They exert an attraction of the type described by Gramsci when elaborating the notion of hegemony [8] (p. 487). In such a context it is not easy to put forth an alternative intellectual framework. The hegemonic system sees current trends as fundamentally positive and argues that prevailing

policies are applicable worldwide and will eventually yield beneficial results. Thus is reasserted the starting point of development thinking [9]: once again, it is widely assumed that a unique way to overcome underdevelopment is to follow the North, directly applying concepts and policies elaborated under alien circumstances.

Such has not always been the case. From the 1950s to the 1970s alternative approaches to development issues were highly influential. Two examples from Latin America are “ECLA structuralism” (ECLA stands for the Economic Commission for Latin America) and “dependency theory”. Now widely rejected as naïve, their basic assumption nevertheless deserves reconsideration: a specific analysis of the “peripheral condition” is needed. In other words, context matters; the same institutions or policy instruments may play quite different roles in central countries than in peripheral regions.

Our point of departure may thus be summarised as follows: (a) global trends are not closing the gap between North and South, so it is necessary to consider alternative policies; (b) knowledge, innovation, and learning are core problems of underdevelopment, so it is not possible to reject prevailing views without specifically addressing such issues; and (c) for revitalizing development thinking, some approaches elaborated in the North can be illuminating if reconsidered in the light of Southern realities.

2. The national systems of innovation (NSI) approach

The theory of national systems of innovation, or the NSI approach [10–15], exemplifies our perspective. From the point of view of the South, this is a potentially useful framework for reconsidering the problems of development. NSI theory analyzes connections between socioeconomic dynamics and technical change, highlighting the interactive, distributed, and potentially systemic features of innovation activities. It takes into account not only economic matters but also political, institutional, and cultural factors. Consequently, it focuses on the behavior and mutual relations of different social actors, thus going beyond a schematic opposition between state and market. It also offers a general framework for studying innovation activities in different contexts, analysing and comparing concrete dynamics and main sociocultural influences.

As Johnson and Lundvall [16] argue, the holistic character of the NSI approach (because of its focus on learning by doing, using, and interacting) ensures its applicability to developing countries. But such application also requires that the theory be adapted and extended. When looked at from the perspective of underdevelopment in the South, the following aspects of the NSI approach are particularly important [17]:

1. NSI is an ex-post concept, built in the North on the basis of empirical findings, although in the South it is an ex-ante concept. In the South, innovation activities, although frequently important, often remain isolated and encapsulated. Consequently, an innovation system as such hardly exists. It cannot be taken for granted, either in academic analysis or in policy making.
2. The NSI concept carries normative weight. This approach stresses the relevance

- of diversity: different types of national systems of innovation exist and should exist, each requiring its own policy support. But some systems are better than others because, for instance, they foster interactions without neglecting asymmetries between interacting actors. This is often forgotten in underdeveloped contexts.
3. The concept is fundamentally relational. What matters is the concrete web of interconnections between different types of collective actors. A system does not come into being just by creating organizations to foster innovation. Especially in Latin America, many such organizations have been created but they seldom operate as bridges between actors.
 4. The NSI concept has policy implications. This does not mean that a system can be created by the state, as some Latin American governments seem to believe. Instead, it means that current situations concerning knowledge and innovation can be submitted to deliberate efforts to change them. Combining general approach analysis with concrete situations can open the way to specific and efficient innovation policies. This should be stressed in underdeveloped contexts, where usually science, technology and innovation are outside the political agenda and, explicitly or implicitly, it is assumed that nothing important can be done in those areas.

It is also observed that the theory under consideration needs to pay more attention to conflicts related to innovation processes. It cannot be taken for granted that they are positive-sum games. Not only are there winners and losers, but such processes often look more like battles than games. In any case, different power relations foster or block innovation activities, shape their evolution, and increase or decrease the probabilities of positive outcomes. In an age of growing inequality, it is important for the North and essential for the South to analyse the interactions between innovation capabilities and different configurations of social {in}equity.

3. Inequality and development

The prevailing economic wisdom that “inequality is necessary to foster growth in the early stages of development” is being increasingly challenged [18] (p. 468). Here we recall that inequality has been negatively associated with development throughout the history of Latin America, while more egalitarian contexts showed much better results [19].

During the second half of the nineteenth century, as Latin America was inserted into the international economy as a peripheral region, specific features were strongly shaped by highly unequal social relations as well as by a cultural undervaluation of science and technology. Speaking broadly, inequality generated inequality. The dominant elites concentrated economic surpluses and then used them in such a way that conspicuous consumption and related imports became, and still are, important economic activities. Consequently, by the beginning of the twentieth century an extreme degree of inequality already existed throughout Latin America. “The social and economic processes of export-led growth, building on the land grants and monopolies of the colonial period, had cemented inequality” [20] (p. 24).

In this respect it is useful to compare the profound differences in power relations that existed in Latin America and in Scandinavia, another backward region that also related itself to industrialized countries from the margins by exporting raw products. In Scandinavia, greater equality and a high valuation of science and technology, oriented economic surpluses toward the building of endogenous productive capacities [21]. For example, peasant cooperatives in Denmark were able to foster mechanization by sharing machines between several families, whereas if each were isolated they would have been obliged to rely on traditional forms of manual labor.

With regard to the marriage between production and science-technology, education is of primary importance. Here the so-called folk high schools were determinant for the democratic modernization of rural areas and another influence on the cooperative movement. Once consolidated, such productive structure had a strong influence on innovation. An important demand arose for productive processes specifically designed for many small producing units that needed to work with similar levels of quality. Another consequence was the successful collective and political action against privatization of technological knowledge via patenting. We have here an example of quite egalitarian and democratic associations that promote a type of economic growth that favours equity. Similar considerations stem from what happened in Sweden, Norway and, later, Finland.

By contrast, the peripheral insertion into the world economy that took place in Latin America cemented inequality, with opposite consequences from those in Scandinavia, where specific forms of equality fostered particular types of innovation. To achieve economic growth it is not at all necessary initially to increase inequality: under some institutional and cultural conditions, higher equality fosters the desired techno-economic “takeoff”.

The negative weight of inequality can also be detected during the period of industrialization by import substitutions in Latin America, a period that extended from the 1930s through 1980s. During this time, growth was quite remarkable. In several countries, equality of a specific type initially increased so that during the 1960s the percentage of people living in poverty decreased [20] (p. 275). However, redistribution of income was generally quite limited. The same can be said, in particular, about land redistribution.

In economies with large rural populations, both productivity and equality are served by land reform efforts. The high rates of inequality found in contemporary Latin America most likely can be traced to the initially much higher inequality of land distribution in the region dating from the nineteenth century and even before [22] (p. 412).

In Latin America, the magnitude of the industrializing effort was seriously limited by a strong bias toward conspicuous consumption and reduced internal savings, a collective imaginary that assigns little value either to technology or to the national capabilities for technological creation, and an entrenched habit of buying abroad almost all the know-how and instruments needed for economic activity. Consequently, once the initial and simpler stages of the substitution of manufactured

imports were completed, the continuation of the process became increasingly dependent on other countries, those now at the center of globalization.

During the 1960s and 1970s this type of growth linked industrialization with inequality. Foreign investment was extensively favored, as a means of obtaining capital and know-how. The relevance of industrial production by local affiliates of multinational firms expanded quickly. Essentially, such production consisted of consumer goods for the internal markets, which could be bought only by the more wealthy members of society. The influence on the general level of economic activity of these sectors consequently grew. Redistributing trends weakened. Some governments, particularly those led by the military, favored the concentration of incomes as a way to foster growth. The last remained strong only while external funding was abundant, and came to an abrupt halt when the debt crisis exploded in 1982. “Truncated industrialisation” [23] was the outcome of half a century of great changes.

At the same time, specific egalitarian trends influenced the most successful industrialization processes of the second half of the twentieth century. As is well known, “land reform played a key role early on in Taiwan and Korea, leading to low inequality and reducing the burden of luxury consumption” [24] (p. 65).

Summing up the main features of the divergence between Latin America and some countries of East Asia, many analysts put education first. In East Asia the trend is characterized as follows: “Expanding education system with high participation in tertiary education and with high proportion of engineering graduates”. The corresponding statement for Latin America is: “Deteriorating education system with proportionately lower output of engineers” [25] (p. 178). While the Latin American experience points to the negative weight of inequality, both the Scandinavian and East Asian trajectories show that high inequity is not necessary for growth; they also suggest that deep connections between levels of (in)equity and styles of development go through learning processes.

4. Learning divides

As already emphasized, globalization is not leading to convergence but to further economic differentiation between countries and between social groups within countries. Over the last two decades, economic differences between rich and poor have increased dramatically in many developed and developing countries alike, and between most developed and developing countries. Yet the fundamental divides that shape structural divergences change over time. The emergence of the global knowledge economy implies that divergences are increasingly related with different social capabilities to participate in knowledge-demanding tasks, that is, with “learning divides”.

Learning is, of course, related to the acquisition of knowledge through teaching and research; it is also critically dependent on opportunities to apply creatively what has been learned. Effective lifelong learning comes through being able to participate in activities where explicit and tacit knowledge is shared, exchanged, and created. We may call such situations “interactive learning spaces” where different actors

strengthen their capabilities to learn while interacting in search of a solution of a given problem [26]. Developed countries and dynamically integrated social groups everywhere show high educational averages and are rich in interactive learning spaces. Underdeveloped countries and disfavoured social groups everywhere have fewer interactive learning places and a lower average of highly educated people.

To assess the learning divides among countries, many metrics are possible. One is to combine the proportion of corresponding age groups enrolled in higher education (as an indicator of acquisition of knowledge), with the proportion of expenditures on R&D in the gross domestic product or with the proportion of engineers and scientists engaged in industry (as indicators of the opportunity to apply creatively what has been learned). In either case, once a table is constructed, the learning divide between North and South is clearly evident, with developed countries grouped around the “high–high” corner and the underdeveloped countries grouped in the “low–low” corner, as illustrated in Fig. 1.

Learning societies can be defined as places where a fair proportion of the population and the social and economic organizations permanently perform knowledge-demanding activities, where many actors need and are able to upgrade systematically their individual and collective skills as well as their awareness of scientific and technological changes. This is fundamental, both to use new knowledge in a socially valuable way and to face the problems posed by such changes. In the most developed parts of the world, in the midst of conflicting trends, an evolution toward learning

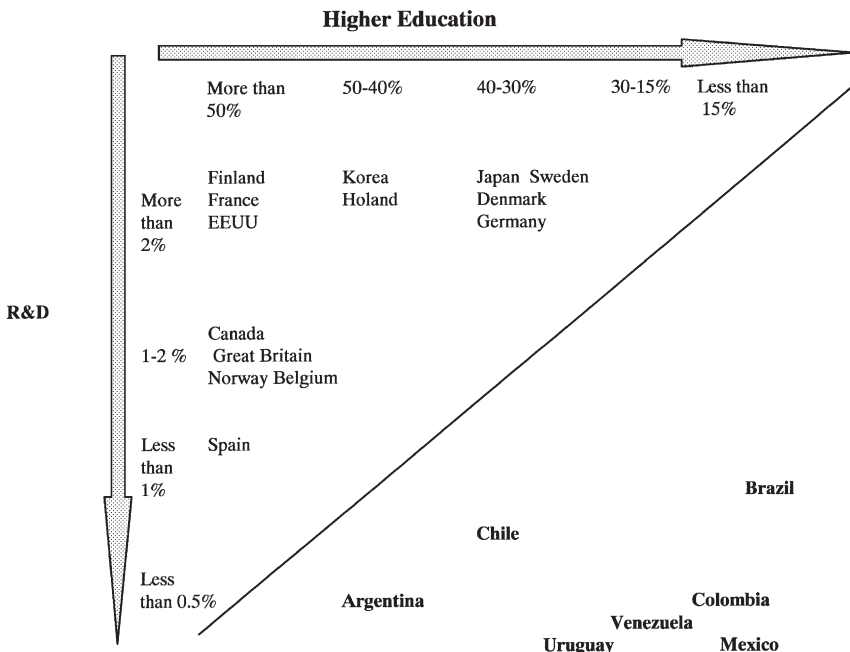


Fig. 1. Learning divides based on higher education.

societies is taking place. Underdeveloped nations are not evolving toward learning societies, and are therefore suffering far deeper problems.

5. Interactions between equality and innovation

The interplay between techno-economic change and social stratification is complex and contradictory. General economic arguments are not sufficient to decide whether or not inequality is always positively or negatively associated with growth. Inequality has many aspects, so alternative ways of promoting equality can have different consequences. History nevertheless suggests a distinction between two types of egalitarian social relations.

Lingarde and Tylecote [21] summarise their long-range comparison between the four Scandinavian countries and three countries of the American Southern Cone—Argentina, Brazil, and Uruguay—by saying that the main difference is the level of inequality, especially in the distribution of land and political power. The conclusion is well based but needs qualification. In Uruguay, inequality has been higher than in Scandinavia, but diminished early and substantially in comparison with Latin America as a whole, so that alone does not explain the specific performance of the country. Demographic and political peculiarities of Uruguay during its expansionist growth period favored the emergence of some capacities for techno-productive innovation and, above all, of an egalitarian trend, in such a way that the former fostered the latter but not vice versa.

The big question is which types of progress toward democracy and/or less inequality are self-sustaining in the sense that they in turn foster growth and innovation. When this reinforcement occurs, we may speak of *proactive* or *creative* equality, i.e., an equality that creates more equality by activating innovation capabilities. This refers to processes that, by diminishing inequality in some particular way, expand the social capabilities for technological and institutional innovation related, in general, with the production of goods and services, thus supporting further progress toward more equality.

In the Scandinavian case, equality fostered innovation in a cultural context that assigned high value to technology in general and to engineering in particular, as can also be seen also in the case of Japan. Both are examples of “equitable-development trajectories,” as described in the following quotation, which eloquently illustrates the idea of proactive equality:

The equitable-development trajectories of the East Asian countries were due primarily to their having equalised access to the main factor of production before investing in enhancing its productivity and its importance in economic growth. Thus, they implemented redistributive land reforms before embarking on rural development. This meant that the benefits from subsequent improvements in agricultural productivity were widely distributed. Also, they invested heavily in universal primary education before embarking on labour-intensive growth. They subsequently widened access to secondary and University education before embarking

on capital-and-skill-intensive growth in the seventies and eighties. Finally, they drastically increased engineering, professional and computer-education before turning to technology-intensive and information-intensive industries. There was therefore no conflict between growth and distribution in these countries. On the contrary, there was a synergistic relationship between them [27].

However, equality does not always foster innovation; sometimes it even retards innovation, thus limiting further progress toward diminishing inequality. The latter happens, for example, when high prices of primary exports favor distributive trends, as in Uruguay during most of the first half of the twentieth century, or in Venezuela during the 1970s. In both cases, the ways in which equality was promoted did not support a strong upgrading of innovation capabilities, and so progress was not self-sustaining. Under such conditions, we may speak of *defensive* or *reactive* equality.

Returning to the comparison between Scandinavian and the Southern Cone countries, we suggest that the differences between the two groups are strongly associated not only with different levels of inequality but also with different types of equality. The first group has been historically characterised by comparatively egalitarian trends and, moreover, by relevant examples of proactive equality. In the second group, inequality has been undoubtedly higher than in Scandinavia, but a broad internal distinction must be made: in Brazil, quite important innovative efforts were fettered by very high inequality, while in Argentina and Uruguay egalitarian trends were stronger but mainly related with reactive types of equality.

Concerning the highly complex relations between equality and innovation, four different “ideal types” of evolution are thus possible. It is assumed that a period of change begins with a situation in which either important egalitarian trends or strong innovative efforts are present. This gives a first distinction between types; the second distinction stems from how the evolution of inequality influences innovation capabilities.

A first type is defined by an initially low level of inequality in a context where power relations and cultural orientations foster reactive types of equity; consequently, growth tends to be slow because innovation capabilities are not fostered and integrated to economic development, social development becomes more difficult, and inequality tends to rise. Uruguay during the 20th century is an example of this case.

A second type is initially characterized by a relatively important innovative effort in a context of high inequality, the economic, political, and ideological roots of which are not strongly confronted. Thus learning and innovation capabilities are not extended and, at some point, growth becomes weak. An example is given by the evolution of Brazil during the second half of the twentieth century.

A third type is defined by initial egalitarian trends that generate strong proactive forms of equity. The Scandinavian experience can be seen as a “socio-centric” and democratically shaped historical proxy to such a case.

A fourth type is characterized by a strong innovation push that is favored by some egalitarian processes and also promotes them. Korea and Taiwan are a “state-centric” examples of such a process fostered by authoritarian regimes—interactions between

equality and innovation were complex and very conflictive but, on average, positive for both, and democratization trends were able to emerge.

Thus, different types of interactions between equality and innovation are related to very different paths of social change.

6. Conclusion: in search of proactive equality

A primary link between growth and inequality seems to be the following: if a period of economic growth does not give place to an important educational effort that diminishes inequality in this fundamental aspect, then further economic growth may be difficult. This has been true at least since the Industrial Revolution, but it is more important today. “Innovation is predominantly a labor-intensive process” [28] (p. 109). Since economic growth is increasingly based on knowledge and led by innovation, it is predominantly a highly qualified labor-intensive process.

The most successful development processes of the twentieth century have many differences between them, but they all show specific combinations of (a) important progress toward less inequality, especially concerning education, (b) virtuous circles between equality, education and a positive technological imaginary, and (c) active and efficient industrial policies, implemented over long periods, and with strong research support.

A simple but nontrivial lesson stems from every story of success concerning long-range development. The combination of learning in a formal system and at work, in a context of relatively low social distance, is a major source of proactive equity, that is, of egalitarian trends that multiply collective capabilities for adapting to changes, for expanding the uses of new technologies, and for upgrading productive activities and innovation. It is difficult to promote equality and even more difficult to promote proactive equality. Development has not been a simple task in the past and does not look easier today.

At the dawn of the twenty-first century, we are witnessing the multiplication and diversification of examples of a vicious cycle in which inequality generates inequality through learning divides. Socio-geographic positions condition the opportunities for study at an advanced level and of learning by working in environments where knowledge is a basic resource. Such opportunities, in turn, are fundamental for acquiring the capabilities that are needed to cope with innovation challenges, to profit from new possibilities, and to face the new dangers that are also being created—all at increasing speeds. The process that intertwines inequality and learning divides is perhaps the essence of the underdevelopment problem today.

Summing up, when approaching innovation from the South, a fundamental issue appears at the top of the research agenda: the empirical and theoretical study of proactive types of equality.

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