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Access, Resources, and Classes in the History of Capitalism: A Theory of Social Stratification from a Cognitive Materialist Perspective

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Abstract: This article aims to apply some concepts from *cognitive materialism* to the sociological problem of social stratification in capitalism, both in theoretical and abstract terms and through concrete historical examples. After discussing the necessity for a theory of social classes, a division is presented between two types of *resources*: those physical intensive, and those which are knowledge intensive. At the same time three alternative conditions of access to these resources are theorized: exclusive access (applicable to physical or intellectual *property*), non-exclusive access, and no access. Combining the different types of resource with the different types of access, we obtain a proposal for a theory of classes, which we apply, in a simplified and schematic way, to various periods. Thus, we analyze social strata in the transition from feudalism to mercantile capitalism, the subsequent transition to industrial capitalism (in which we distinguish two clearly differentiated stages), and finally, in the current transformation into informational capitalism.

Keywords: Social classes, Informational Capitalism, Materialism

1. Introduction: The Need for a Theory of Social Classes

It is difficult to imagine a more natural subject for a social scientist than social stratification: natural in terms of being proximate, but also indomitable. In the first sense, it is clear that the organization of society into groups whose members present certain affinities between them, as well as particular divergences, is a universally accepted phenomenon. In fact, social stratification is one of the few themes in which social science finds it easy to make contact with the average person in the street. In the everyday speech and practice of this individual (who knows little to nothing of Durkheimian solidarity, Weberian typologies of action, or Marxist surpluses), the notion of class pulsates. Hence, every subject who appears before his/her gaze triggers an instantaneous and profound examination: their wealth and power, their work and their way of looking at the world will be weighed up and they will end up being inscribed ineffably in this or that region of the class register.

But the problem of social classes is also natural, we claim, because it is far from having been overcome by social sciences. In effect, despite this theme having been approached by all the classics there is not yet anything resembling a consensus around the problematic. An analysis of the extensive bibliography about the specifics of this question is not within the remit of this text (cf. Yansen 2012). However, we should point out that our intervention is not accidental. It emerges from a period in which the notion of class and, indeed, the idea of social strata, have been blurred in the social sciences and humanities. In this era of networks, rhizomes, multitudes, social movements, citizens, etc., class divisions are dealt with derogatorily, as a hindrance coming from outmoded totalizing theories; as a simplification that commits outrage against the diverse multiplicity of Being. Naturally, it is the history of capitalism (and of its classes), which explains these trends and not the other way around.

This article is organized as follows. This introduction is the first section. The second is theoretical and it is three-fold. First, it sketches out our theoretical perspective, cognitive materialism. Second, it offers our perspective regarding the periodization of capitalism and, in particular, deals with the characterization of the present stage, informational capitalism.

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Third, it discusses one of the notions we want to redefine, that of cognitive workers. However, some readers, i.e. those exclusively interested in the topic of social classes, can happily skip this second section and jump to the third one. In the third section, drawing on cognitive materialist concepts, different types of resources and access to them are presented, in order to put forward an abstract and atemporal schema of social classes. From this point on in the paper the historical analysis of classes is developed.

In the fourth section we focus on the transition from feudalism to mercantile capitalism, while the fifth is dedicated to the classes in mercantile capitalism. The classes of industrial capitalism, subdivided into two phases, are discussed in the sixth section, while in the seventh we concentrate on the present stage, informational capitalism. Finally we present our conclusions.

2. Cognitive Materialism, Informational Capitalism, and Cognitive and Informational Workers

In previous papers we have presented an analysis of capitalism based on a particular theoretical framework, one that we call cognitive materialism (Zukerfeld 2010a, b). Naturally, explaining this perspective in detail exceeds the scope of this article. However, some definitions are sketched here.[1]

2.1. Cognitive Materialism

Cognitive materialism holds the basic assumption of every materialist philosophy: all and only material objects are real.[2] Now, according to cognitive materialism—and starting to depart from other emergentist materialisms- matter comes into three forms: M, E and Kn. We use M to refer to the set of entities that have a mass and volume; E for energy and Kn for knowledge. M and E (M/E onwards) are the *physical entities*. Knowledge, which only exists in a material bearer, is a non-physical but material entity. *Thus, there is no knowledge as an immaterial entity, only as an emergent property of M/E. This, from the point of view of knowledge, becomes a "bearer".*

It is evident that the bearer of any knowledge conditions several of the ontological, economic and legal properties that such knowledge assumes. For example, that the idea of a Wheel (a conceptual object, "non-real" according to Bunge 1981) becomes knowledge (a material object, real) as an individual mental representation, as a reification in a determinate object, or as a codification in a text (three different bearers), confers very varied possibilities to this knowledge, of, as the case may be, being transmitted widely, being considered useful, or falling into oblivion.

Now, one of the central ideas of this perspective is that of studying capitalism on the basis of the stocks and flows of different types of M/E on the one hand, and of knowledge on the other. This comes from the fact that each one of these entities is subject to a specific type of capitalist regulation: a broad group of institutions regulate access to M/E (physical private property is the most well-known); meanwhile, a "bundle of rights" govern access to knowledge (the varied forms of intellectual property are the most common).

[1] This section was expanded in order to respond to the insightful suggestions of an anonymous reviewer.

[2] We follow Mario Bunge in this regard: "An object is real if, and only if, it influences, or is influenced by, another object, or is composed exclusively of real objects" (Bunge 1981, 23). Material objects (entities) are defined by the fact that they are *changeable* (Bunge 1981, 20), in opposition to immaterial or conceptual objects. In turn, matter is the set of material objects. It is not unusual to split materialist philosophies between emergentist and physicalist (or reductionist). Cognitive materialism is a kind of the former, which claim that matter organizes itself in systems with emergent properties. This means that the properties of a certain level cannot be reduced to the properties of another level. Certainly, we do not share Bunge´s perspective concerning social sciences.

Whereas we adopt the mainstream concepts and typologies of M/E, we understand knowledge in a very different and much broader sense than the usual ones.[3] The core of cognitive materialism is to distinguish different kinds of knowledge regarding their material bearers. Thus, we have developed a typology, which includes biological, subjective, intersubjective and objective forms of knowledge.[4] Finally, the picture of the flows and stocks of different types of knowledge for a certain time and place results in a system that we call Cognitive Materalist Configuration (CMC).

Of course, knowledge is translated all the time from one type to another, gaining and losing something in each translation. And certainly, different kinds of knowledge are always producing excesses and contradictions. Therefore, the knowledge system is always unstable, always "becoming" (*werden* in German).

Now, let´s focus on one particular type of knowledge, that is, Normative Intersubjective knowledge (see footnote 4). It is a very particular kind of knowledge, since it encompasses the regulation of both knowledge and M/E. And, as was said above, it does that mainly through two kinds of institutions: physical property and the agglomeration of institutions we´re now accustomed to calling intellectual property.

Normative Intersubjective Knowledge, therefore, regulates the whole CMC. As the reader has probably noted, the notions of CMC and normative intersubjective knowledge are to some extent equivalent to the old Marxian concepts of Productive Forces and Social Relations of Production, respectively. Although there are many differences between our proposal and Marxism, we want to mention one aspect in common: the dynamic of capitalism is explained, ultimately, by the contradiction between the productive forces/ cognitive material configuration and the social relations of production/normative intersubjective knowledge. When this contradiction is sharp, the latter adapts (usually through sinuous and complex ways) to the former, resulting in a brand new stage of capitalism. This leads us to the next sub-section.

2.2. Stages of Capitalism and Informational Capitalism

In our view, the proper way to define a stage of capitalism is to present its cognitive materialist configuration. In other words, while periods should be treated as totalities, they can´t be reduced to one single contradiction, no matter how important this contradiction is. Its stocks, flows and translations of different kinds of knowledge should be carefully analyzed[5]. We have tried to do this in previous studies, and come to the conclusion that capitalism should be un-

[3] But, what do we understand by "knowledge"? Evidently, we use this term in a much broader sense than is usual. Knowledge is an emergent system. That is to say, it only exists *upon* some physical bearer in which it is based, but it´s not reducible to it. Likewise, knowledge represents negative entropy. M/E is finite and limited, it is not created, nor can it be destroyed, only transformed (as the laws of conservation indicate). Knowledge, however, is born and expands, but it can also die. Thus, with a certain license, it could be said that M/E has an immanent existence while knowledge is transcendent. In economic terms, knowledge is that whose consumption does not run out (it is non-rival, infinitely expansible—as Jefferson puts it—or has zero subtractability). The human individual, the human collective, the biological human and non-human, and the inorganic that has been shaped by flows of social knowledge, all these are forms of knowledge.

[4] Biological knowledge includes the genetic, endocrinological and neural information flows of living beings. Subjective knowledge includes the explicit and implicit memories of an individual´s mind. Intersubjective knowledge rests on social groups. It comprises five sub-types: linguistic (knowledge about codifying, decodifying and creating codes), recognition (knowledge of others and of the self; the glue of social networks, akin to "social capital" or "know who"), organizational (knowledge that arises in any form of division of labor or other activities), axiological (intersubjective beliefs and values) and normative (regulations internalized by people and usually enacted by law; physical property and intellectual property are the two main types of normative intersubjective knowledge). Objective knowledge encompasses, on the one hand, *technologies* (among them, digital technologies); on the other, information. As is well known, information and, particularly, digital information, has marginal costs close to 0. We call this *replicability* of Digital Information.

[5] As the reader has probably noted, here we are trying to highlight the relevance of two Hegelian notions: *negativity* but, more emphatically, *totality*.

derstood in three stages: Mercantile, Industrial and Informational (Zukerfeld 2010a, b). However, since this article is devoted to the specific subject of social classes, we are going to oversimplify this point.

As was pointed out above, one key element necessary to understand the shifts in the history of capitalism is that of the contradiction between the totality of knowledge flows and stocks and one particular kind of knowledge: normative (which is, of course, a part of the totality and not an exogenous variable[6]). Normative intersubjective knowledge includes, at least, physical and intellectual property. Regarding mercantile and industrial capitalism we are going to limit our comments to the scarcely discussed role of intellectual property while regarding informational capitalism, we are going to expand a little bit more our description. Of course, this characterization of stages aims to be nothing more than an input for the discussion of social classes in each period.

2.2.1. Mercantile and Industrial Capitalism

In the hundred years spanning from the second half of the 15th century to the first half of the 16th century, a series of profound changes in Western civilization took place. From high school we have been instructed about the facts and years that marked the end of Middle Ages: 1453, the capture of Constantinople by the Turks; 1492, the arrival of Columbus to America; circa 1450, the invention of the Gutenberg press; around 1517, the Protestant Reformation. Besides specific facts and years, there is some consensus about the speeding up of merchant activities in those 100 years, giving rise to Mercantile capitalism. Now, in the middle of that period, and right in a region where merchant capitalism was flourishing, an unprecedented event took place. A fact that does not receive attention in any high school history book, nor in college books on the history of capitalism. This is the Venice Act of 1474, which established the first modern regulation of patents, fostering the attraction and diffusion of valuable knowledge to that Kingdom.

When we turn to study Industrial capitalism, the period starting in the third quarter of 18th century, and despite the fact that the origins of this phase have been much more widely reviewed than the above, we find the regulation of access to knowledge is again neglected in the grand narratives. Rivers of economists ink have been devoted to other normative regulations: the enclosures of physical resources, the double freedom of labor power; and also to technological knowledge (machinery) and physical resources (coal). Mountains of books are filled with the importance of axiological knowledge (the Enlightenment, Contractualism, Political Economy) and modern science. However, as discussed elsewhere (Zukerfeld 2014), by the time of the Industrial Revolution, England was the first and only country that had stabilized the regulation of copyright and patents (in the contemporary sense). Through some Acts (Statute of Monopolies, 1623; Act of Anne, 1709), but specifically through some key rulings (Liardet v. Johnson, 1778; Baker v. James, 1753, among others), England developed clear laws framing the notions of author, inventor and public domain. Although the process is far from linear, it is clear that regulation of access to knowledge had a close link with the launch of Industrial capitalism.[7]

2.2.2. Informational Capitalism

During the second half of the 20th century, the CMC of industrial capitalism was dramatically transformed. M/E flows were modified, particularly by the oil crisis of 1973. New productive processes capable of being less physical intensive were in need. Regarding biological knowledge, humans learned to read the language of life from 1953 (double helix of DNA), and to write in this language from 1973 (genetic engineering): business and axiology were

[6] The idea that the terms in a contradiction are the totality itself and a particular part within it is extremely important, due to it being specifically opposed to non-Hegelian inspired Marxisms, which tend to lose the notion of totality.

[7] The most obvious (although challenging) link is that of the patent system. See Mokyr (1985) and especially, Crafts (1985). Also the rise of the notion of authorship and copyright law is extremely relevant. See Chartier (1999).

shaken by this change. In turn, subjective knowledge rose dramatically through the expansion of formal education creating a massive amount of cognitive workers, and multitasking abilities were increasingly developed. Intersubjective knowledge presented various changes. The pyramid disciplinary organization went into crisis: from schools to firms, institutions evolved towards new flexible (regarding space and time) organizational forms. This is related to changes in axiological knowledge. Speed, flexibility, connectivity, ephemerality and Dionysian values began their ascension. Recognition knowledge also underwent profound transformations: the industrial opposition between society and individuals became a relationship between networks and nodes (or "dividuals"). Finally, objective knowledge brought various well known changes. Increasingly powerful digital technologies for processing, storing and transmitting digital information spread. Digital information grew partially due to the fact that more and more entities became capable of being translated into digital forms. For instance, some 90% of the money in the world today is digital information. The opportunities for costless reproduction and fast circulation became enormous. On the other hand, software became the most powerful means of production of the new stage.

To summarize, we understand, partially relying on Christian Fuchs[8], Manuel Castells[9] and, to some extent, the advocates of Cognitive capitalism,[10] that industrial capitalism evolved into informational capitalism.[11] For the sake of operationalization, here we are going to limit our

[8] In several respects, Fuchs´s concept of (transnational) informational capitalism is akin to ours: he draws on dialectics, retrieves and updates the notions of class and exploitation, and criticizes non-materialist conceptions. (See, for instance, Fuchs 2010; 2011). However, we have some minor differences. Among them, as the main text shows, our class scheme is slightly different to his.

[9] The term informational capitalism was coined by Castells (1996). Although we follow his theory in many aspects, we also depart from it in many ways. First, informational capitalism is for Castells—in the vein of Bell—a combination of two variables: a mode of development (informationalism) and a mode of production (capitalism). On the contrary, for us it is a third stage of capitalism, after mercantile and industrial (following here the cognitive capitalism perspective). Second, according to Castells, informational capitalism is the economic side of the "Network Society". So he adds cultural and political elements as external to informational capitalism. On the contrary, we understand capitalism as a totality, which is cultural no less than economic, political no less than technological. Of course, this is the opposite of the idea that one sphere (i.e. economic) determines another (i.e. cultural). Productive processes are the key, but they have to be understood as producing not only merchandise, but also subjectivities, affects, values, and so on. Third, Castells perspective does not take into account the role of intellectual property in order to grasp this new stage.

[10] We follow cognitive capitalism theory in three aspects: the aforementioned idea of a third stage, the analysis of capitalism as a totality and the focus on intellectual property. However, we have several important differences. First, the adjective *cognitive* is not clear at all. As discussed elsewhere (Zukerfeld 2008) every stage of capitalism has relied on new knowledge, and on the institutions regulating this knowledge. So, it makes no sense to call this stage "cognitive". Moreover, these authors do not discuss the relevance of knowledge and, particularly of what we call now "intellectual property" in previous stages. Indeed, ideas like that of a "second movement of enclosures" (lands in the first one, knowledge in the second) obliterate the chance of linking IP to previous phases of capitalism. This is why these authors are not concerned, for instance, with the decisive role that English patent regime had in the launch of the Industrial Revolution. Second, the association between knowledge and the concept of *immaterial* is exactly the opposite perspective to that adopted from a cognitive materialist standpoint. This, of course, applies also to Gorz, Negri, Hardt and other authors. Third, the lack of empirical evidence mentioned in the main text is, from our perspective, a serious defect. Fourth, the intellectual tradition which ultimately inspires cognitive capitalism is that of Italian autonomism and French post-structuralism: Negri, Lazzarato and, more deeply, Deleuze and Foucault. On the contrary, our perspective is ultimately Hegelian, as the reader has probably already noticed.

[11] Of course, there are various additional valuable concepts and authors that characterize this stage of capitalism. Lash (2002); Poster (2006); Zizek (2009); Rifkin (2000); Schiller (1999), among others. Persuasive as they are, all of them tend to support their claims with philosophical, political or rhetorical arguments. Thus, empirical bases are mostly absent, let alone statistical ones. Moreover, no one in this group has assessed the relevance of (what now we call) IP in *previous* periods of capitalism. In other words, those authors (contrary to the previous group) *hold that the regulation of knowledge is*

brief characterization to a specific but paradigmatic issue: informational productive processes.[12] These can be defined around four features:

i) The main means of production are digital technologies (from notebooks to smartphones), digital information (software, data, etc.) and networks that combine both of them (internet).[13]

ii) The consumption of physical inputs by unit of output (physical intensity) is many times lower than in industrial productive processes—as the proxy[14] in figure 1 shows.

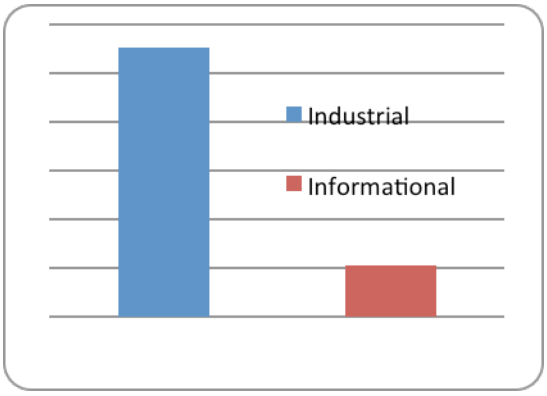

Figure 1: Consumption of energy inputs in Industrial and Informational Productive Processes. (US, 2011, as % of Gross Output). Source: Author´s elaboration based on KLEMS statistics from Bureau of Economic Analysis.

The low weight of energy per unit of output implies that knowledge takes the lion´s share in these productive processes. To some extent, this is related to the role of digital technologies and digital information. Nevertheless, other forms of knowledge (subjective and inter-subjective) are just as important.

iii) The output consists, mainly, of some specific goods.15 Somewhat following Hal Varian (Varian 1995) we name them Informational Goods (IG).[16] We understand there are three types of IG. a) The IG1, which are informational goods in the strictest sense, have the particularity of being purely made of Digital Information. Software, music,

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really important in this stage, *but not previously*. Not only IP regulations, but knowledge itself is seen as a critical resource only for this stage.

[12] Notice that *productive process* encompasses but exceeds *work.* Indeed, some of them occur in leisure time. Also, a productive process (capitalist or not) results in the production of goods, services *and subjectivities*.

[13] The Internet, as a combination of various layers of digital technologies and digital information is a key to understanding informational productive processes today. Specifically, the current open Internet architecture based on TCP/IP protocols is a cornerstone of those processes.

[14] For the industrial processes we have used the data on manufacturing. For the informational processes we have used the sum category ICT of KLEMS, which consists of computer and electronic products; publishing industries (including software); information and data processing services; and computer systems. This proxy has many shortcomings. For instance, it does not measure the human energy used in the processes, but it is enough to root our point in an indicator.

[15] That is: *goods*, and not *services.* For a discussion of this common confusion found in many of Bell's unaware followers—like Hardt and Negri—see specifically Hill 1999 or, more broadly, Castells 1996, chapter 4.

[16] Varian coined the term *Information Goods.* But he is only concerned with what we call here Primarily Informational Goods. Additionally, Varian does not recognize a change of stage in capitalism and, moreover, he thinks that neoclassical economic theory does not need any major revision.

images, text, etc. are included in this group. b) The IG2, process, transmit or store DI as the main distinctive feature. Chips (and computers which depend on them), DI storage devices—such as DVDs, and DI transmission appliances—like semiconductor silicon- are examples of IG2. c) The IG3 refer to the resulting products of biotechnological applications: the pharmaceutical industry, genetically modified organisms, etc. Informational goods are more or less sensitive to the replicability of digital information depending on the relative weight of digital information in their productive processes.

iv) As is implicit in the lines above, intellectual property is much more relevant regarding those productive processes than physical property.

Returning to normative intersubjective knowledge, in industrial capitalism, physical property was the main institution. Patents, copyrights and so on certainly played a role, as we are going to highlight later on. However, as the production function of industrial productive processes was dominated by matter/energy, their main regulation was physical property. This institution was laboriously built as the main legal, philosophical, economic and cultural tool of the period. But the institutions of industrial capitalism were found lacking in their ability to deal with informational production processes. Not only physical property but especially the institutions regulating knowledge in industrial capitalism were revealed as insufficient. Patents, copyrights, trademarks as we used to know them were molded to meet industrial production processes, not informational ones. They were not devised to enclose informational goods or to regulate the key productive processes of the stage.

Therefore, a central task in order to stabilize informational capitalism was (and still is) a readjustment of normative intersubjective knowledge ("social relations of production") to the changes in CMC ("productive forces"); beyond the adaptation of physical property and other institutions, it became particularly necessary to organize the exclusions and inclusions around certain types of knowledge and goods, digital information and informational goods respectively. In previous studies we have tried to empirically demonstrate that a powerful part of the readjustment took place through the massive and systemic expansion of intellectual property law (Zukerfeld 2010b).

2.3. Cognitive Workers, Informational Workers, and Knowledge in Class Analysis

One of the concepts we are going to use in our scheme of classes is that of cognitive workers. Since similar terms have a widespread use in the literature, it´s necessary to differentiate the meaning given here from that of other authors.

Indeed, in the fields of mainstream economics and management the concept of *knowledge work* has been widely used and measured (Machlup 1962; Drucker 1969; Porat 1977; OECD 1981, 1986, 1996, 2009; Cutcher-Gershenfeld 2000; Nonaka and Takeuchi 1999; Fruin 2000; Dordick and Wang 1993; Davenport and Prusak 2001; Kim 1996; Boon, Britz and Harmse 1994). Despite the usual lack of analytical definition, these jobs are supposed to involve advanced academic qualifications and to be related to the manipulation of symbols (Reich 1993).

On the other hand, and from a different theoretical standpoint, the concept of *immaterial labour* has become very fashionable (Lazzarato and Negri 2001; Negri 1999; Virno 2003; Lazzarato 1996, 2006). In a nutshell, it includes several forms of labour associated with digital technologies, but also the so-called affective labour (that of the nurse, typically, but also professional services, the entertainment industry, etc. See Hardt and Negri 2000).

Both concepts—knowledge work and immaterial labour—share some problems from a cognitive materialist perspective. First, they tend to neglect the relevance of knowledge activities in previous stages. Thus, they identify a type of work, which has existed across different stages of capitalism with only the current stage. Second, they are not defined in a materialist way. Third, as a consequence of the first flaw, these concepts tend to understand that this kind of work lies in the present stage within the services sector.

Now, in this article we are going to use the term cognitive work to refer to the kind of work in which the share of knowledge used exceeds that of physical energies, as discussed in the next section. Cognitive work is, within our theoretical framework, an abstract and ahistorical category, which can only be analyzed through its concretization in a particular stage. On the other hand, to refer to the specific kind of cognitive work that characterizes informational capitalism, we will resort to the notion of *informational work*. It encompasses the workers that use a digital technology as their main means of production (IG2) and whose main products are flows of digital information (IG1). Thus, these definitions distinguish the universal and abstract category (cognitive work) from its particularization in a certain stage (informational work) and both are rooted in materialist definitions.[17]

However, the relation between knowledge and social classes has been discussed beyond concepts such as knowledge workers or immaterial labour.[18] Indeed, Poulantzas (1973, 1975), Wright (1979; 1989; 2015), Bourdieu (1985, 2001) and others have tried to bring the Weberian idea of different kinds of (what we call here) knowledge as valuable resources into the Marxian scheme. Although an analysis of these theories lies beyond the limits of this paper (instead, see Yansen 2012), some shortcomings of these approaches are touched on here.

The most obvious of these limitations is that intellectual property, that is, the legal barrier to access to knowledge is not considered by the aforementioned authors. On the contrary, our perspective claims that the history of capitalism, and especially its shifts of stages, is linked to the history of what today we call "intellectual property". In the same regard, knowledge typologies are absent. That is, we are assuming that, for example, "goods of organization", "goods of qualification" and "social capital" are different forms of knowledge. The authors themselves do not make that explicit, but this is our reading and we have integrated this into our typology (intersubjective organizational knowledge, subjective knowledge and intersubjective recognition, respectively). Thus, these authors do not develop the idea of the relevance of knowledge for a scheme of social classes explicitly enough.

3. The Proposal: Classes from an Abstract Perspective

Going back to cognitive materialism, we need to highlight that both entities (M/E and knowledge) combine in a variable way in two types of resources: goods and subjects.[19] In such a way that every good (and every subject) is linked to capitalism in two ways: both by some form of regulation of their physical aspect and also in some way relative to their cognitive side.[20] To extrapolate these ideas into a theory about social stratification we must clarify some notions about different types of resources and access to them.

3.1. Types of Resources: PIR and KIR

Evidently the resources contain variable proportions of M/E and knowledge, as a result of which the weight of both regulatory methods will be varied. Both types of rights are applicable to a book, for example, but those pertaining to intellectual property, those related to the cognitive aspect, are usually more economically relevant than those pertaining to ownership of the pages, covers, etc—in other words the physical property of the material object itself.

[17] For a development of the concepts of informational work and informational sector, see Zukerfeld (2013).

[18] Other authors have coined specific notions of knowledge classes for informational capitalism. Probably the most cited is Wark´s (2004) Vectorialist and Hacker classes. However, this scheme cannot take into account the several other classes that shape capitalist societies.

[19] This assertion, of course, implies a rupture with the humanist traditions of modernity (including that of Marx).

[20] Of course, the ownership of both aspects (material and cognitive) of a resource can—and usually does—fall on distinct legal subjects: whoever buys a car becomes the owner of the material aspect, while one or more signatories continue being owners of the patent rights and brands that pertain to various parts of the vehicle. At the same time, whoever is title-holder of the authorship rights of a song is not necessarily owner of the CDs on which the music is recorded.

On the other hand, intellectual property carries less weight in the case of a table (generic) in which the most relevant regulation is that related to physical ownership of the physical object.

Now, beyond resources in general, for our objectives it is necessary to take into account the productive resources, that is, those which are utilized as the means of production. We would like to analyze two kinds: M/E or physically-intensive productive resources (PIR); and knowledge-intensive productive resources (KIR). But, how do we understand which aspect is the more or less relevant?

Although the question seems intuitively simple, it is actually complex in analytical terms. There are two variables, which can be confidently used to differentiate PIR and KIR:

i) The relative costs of M/E and Knowledge contained in each unit of the resource, that is to say, the proportion of production costs for the resource in question.
ii) The proportion of effective use of the M/E and Knowledge of the resource in question in the production process in which it functions as a means of production.[21]

Two further clarifications are necessary with regard to these conceptualizations. The first is that we are discussing proportions of M/E and Knowledge, and not absolute quantities. This implies that there could be KIR that contain and use lower magnitudes of knowledge than some PIR in cases when the former have recourse to tiny quantities of M/E. Returning to the example of the productive process in which a worker uses a computer merely for the purposes of inputting data, here the worker is a KIR, because in spite of the fact that the cognitive mass put into motion by his or her activity is very small, the expenditure of energy is even lower. A contrasting case would be a highly qualified sportsperson bearing a great deal of knowledge who could be a PIR due to the expenditure of vital energy predominating in the particular productive process they are involved in.

The second clarification points to the idea that this conceptualization can only be made in a historically situated way, which is to say synchronic and comparative. A manual worker at the beginning of the 20th century (who we imagine exhausting their vital energy to the limit and with a cognitive heritage marked more by experience than by the complexities of a prolonged apprenticeship) is a PIR, while a cognitive worker of the period, such as a journalist, is a KIR. This does not mean that if the comparison were made in a diachronic way that the result would be the same: the manual worker of the 20th century compared to a hunter from a prehistoric tribe is, of course, a knowledge-intensive resource. For this reason the classification only holds for historically determined situations.

[21] The variable of costs refers here to the productive process of the origin of the resource, while the variable of effective use refers to the productive process of the destination. A significant limitation to the use of costs as an isolated variable lies in the fact that, as is well known, the effective use can vary in relation to the proportions in which the resource was produced. This is particularly common where the resources are subjects: in these cases it's possible that they were created as a KIR but that they end up being applied in productive processes in which they function as a PIR. But there could also be, as technological constructivism demonstrates, divergences between production costs and effective use when the resources are commodities. For example a computer, a KIR due to its production costs, can be utilized as a typewriter (a PIR).

Inversely, defining PIR and KIR based on their effective use has the drawback of losing sight of objective aspects: to continue with the example of the computer, the fact that in one given productive process it is utilized as a PIR does not remove its objective potential to be put to use as a KIR, let's suppose by another worker as the case may be. The same occurs with subjects: their objective cognitive foundation, their unutilized skills can be exploited.

How do we resolve this tension? In practical terms, maintaining both variables. Given that in most cases they coincide, there are no difficulties in classifying the resources. But in those cases where they diverge, we turn to an intermediary concept: the *potential use* of a resource. This refers not only to the current use of the resource, but also to the *possible uses within the productive process it is inserted into*. This potential outlook includes, indirectly, the question of production costs, which configure a certain objective potential for use as PIR or KIR.

3.2. Types of Access: Exclusive, Non-Exclusive, and No Access

We will now move on to look at the types of access[22] to these productive resources. In addition to the exclusive regimes through which subjects either do or do not have access to goods, these goods can be regulated by intermediary methods. In effect, goods can—and usually do—have one (or two) of their aspects regulated under a non-exclusive regime (in other words, not privative). For example, a recently published book in a public library has its material component covered by State public property even though its intellectual aspect is subject to copyright law. The reverse happens in the case of the generic table mentioned earlier: the stored-up knowledge this contains is within the public domain, while its material aspect is subject to private ownership. In a more systematic way, if we imagine the relationship between a determined subject and any productive resource it is useful to present three situations, three types of access.

The first is exclusive access: it relates to the property forms in which the subject is owner of the resource and utilizes the possibility of excluding third parties as a means of obtaining an economic advantage. Physical private property and intellectual property are some current forms of this type of access, although not the only ones.

The second is non-exclusive access: it relates to the possibility of the use of a resource of which the subjects using it are either not the title-holders—but have acquired a use-right, or being the title-holder use it for themselves, without obtaining profit from the use of third parties—without availing themselves of the possibility of exclusion as a means by which those third parties are be subsumed within it.

The third is the condition of no access: this usually indicates situations in which the subject gains access to the resource in question in invalid or proportionally insufficient quantities to be able to have an effect on a determined productive process. The condition of no access implies that the resource is not useful for the subject in question to differentiate themselves from other subjects and to compete for consumer goods by virtue of this resource. In exceptional circumstances, this category refers to situations in which the subject gains access to the resource, but for whatever reason doesn't use it as a means of production in any significant way.

The main argument of this paper is that, combining these forms of access, which include but exceed ownership, with the two types of resources, which broaden the typically considered variables, we can obtain a potential model of diverse social groups. A model that, at the same time, gives an account of the complexity without losing the antagonistic dimension that confronts owners and non-owners of resources, and which also allows us to think about the various historical stages of capitalism.

3.3. The Abstract Schema of Classes

In effect, combining the three modalities of access to both types of resources we can obtain an abstract and, within capitalism, a-historical schema of social classes. This is a preliminary but fundamental step before observing how each category takes a particular and variable physiognomy, how history moulds it and reshapes it again and again in its transformation. We will look at not only how these classes have adopted different forms and roles throughout history but also how they have been variously described by authors from heterogeneous time periods and geographical locations. Each period will see the rise of some classes at the same time as the silent or explosive decline of others; the period will lend its name to some of them, and at the same time those classes will name the period after themselves.

Naturally, the distinction between an abstract schema of social classes and a concrete one is not a novel innovation of this paper. However, a contribution that we do seek to make is to take a step towards the systematization of this distinction and to theorize about what is invariable and what is contingent in the history of classes in capitalism. That said we could consider the schema presented in Table 1.

[22] The idea of using the notion of access to property in relation to social stratification is in line with Zukerfeld (2009) and, in the final analysis, takes inspiration from Rifkin (2000).

		Access to Physical Intensive Resources		
		Exclusive	Non-exclusive	No Access
Access to Knowledge Intensive Resources	Exclusive	1.Capitalists	2.Cognitive capitalists	3.Cognitive rentiers
	Non-exclusive	4.Physical capitalists	5.Self-employed workers	6.Cognitive workers
	No access	7.Physical rentiers	8.Physical (manual) workers	9.Excluded workers

Table 1: Classes in capitalism (prepared by the authors)

At the most general level, we must distinguish between those who obtain their income from some form of exclusive access or property and those who earn it from selling their labor power.[23] The former group, who we generically call capitalists, includes, in addition to capitalists strictly defined (1), two sub-groups of the same: cognitive capitalists (2) and phyisical capitalists (4). Additionally the extended capitalist family includes two types of rentier: cognitive (3) and physical (7) (the latter, unlike the former, do not in any way participate in the productive processes to which they lend their resources). For their part, the workers include principally the cognitive workers (6) and physical workers (8), but there are also self-employed workers (5) and excluded workers (9). The numbers in brackets should be widely referred in the following pages. We agree with several theories regarding the fact that relations of exploitation link capitalists and workers, as a whole.[24]

Perhaps it would be advantageous to specify the scope of each of these abstract categories.[25] However, due to space constraints, we prefer to allow the historical transformation to help us trace the contours of each. Throughout the remainder of this paper the reader will repeatedly see in parentheses the numbers that identify each one of the classes from our abstract schema. In doing so we will relate determined concrete groups situated in specific coordinates with the generic classification we have presented.

[23] This scheme focuses on the productive processes where monetary exchanges take place. Unpaid workers (such as domestic workers and voluntary workers of digital media) are subsumed to the class of who pays his/her bills. This does not mean that these workers are not exploited and, even, exploited by capitalists. However, we tend to think that classes should be defined according to the productive process that allows subjects to reproduce their material life.

[24] The topic of exploitation is a crucial but complex one that we can´t tackle here. Capitalist exploitation comes in two forms: physical and cognitive. However, it is not the case that cognitive exploitation occurs regarding cognitive labor and vice-versa. Both are frequently used in each kind of productive process. We are currently working on this topic (Zukerfeld 2015).

[25] For a more detailed description, see Yansen 2012.

4. From Feudalism to Mercantile Capitalism

To understand capitalism we have to start from the feudal mode of production that preceded it. To do this, we turn back to the schema presented in Table 1, but with some caveats. The first is that we are not yet dealing with classes, given that we maintain the Marxist idea that classes, in the strictest sense, appear with capitalism (Marx and Engels 1970 [1846]; Giddens 1979). The second is that as a consequence, specifically capitalist social groups (1, 2 and 4) do not appear in any significant way. However, social groups composed of rentiers and workers do appear. The third is that, once we bear the typology from Table 1 in mind, it is helpful to complement it by giving an account of specific periods with other charts that allow us to visualize the relative power and quantity of the different strata.

It is usually claimed that the fundamental contradiction in the feudal mode of production, is between the feudal lords and the serfs (Marx and Engels 1970 [1846]). While the former are merely physical rentiers (7), landowners and warlords, and removed from the productive process, the latter are a specific form of physical worker (8), especially agrarian workers. Put simply, in a rural economy the serfs carry out tasks which are based much more on the consumption of their energies than on the application of their mental faculties. However, this fundamental contradiction is very far from being sufficient to understand the social stratification of the period.

Meanwhile, the apex of the feudal pyramid belongs as much to the landowners as it does to the proprietors of the soul; as much to feudal powers as to ecclesiastical powers. In fact, the friendships and conflicts, the circulation and splits between them populate the surface of the history of feudalism. Here a fundamental feature of our schema appears: the religious structures, as much as those of the feudal estate, base their power on the monopolization of resources: here not the land or military forces (which come to them as an added extra), but knowledge. Indeed, the clerical strata are nothing more than cognitive rentiers (3), wealthy proprietors not only of knowledge related to the afterlife, but also a broad range of secular knowledge; legal proprietors of a good part of knowledge as a whole.

More important is to show that, with the transformation of feudalism, between the lords and the serfs new lateral categories increasingly emerged. Categories that share an origin: they begin as serfs who in some way manage to make themselves wholly or partially independent from their lords. Some of these serfs, with the consent of the local noble, become small-scale independent farmers, exploiting communal or even privately-owned parcels of land. These proprietor or smallholder peasants from the commons who have a non-exclusive access both to cognitive as well as physical resources are a type of self-employed worker (5) in our schema.

That said, other serfs, far from receiving the consent of their lord, flee the estate and take refuge in the cities. There, some remain without distinctive cognitive resources, and offer their physical energies as day-laborers (8). Others fall into vagrancy (9). But a large quantity of these escaped serfs, or rather their children and grandchildren, will arm themselves with practical knowledge. Their families and their bodies will put these valuable skills to use in order to put clothes on someone else's back. At some point, guild organization will be born as the legal form that will regulate those cognitive monopolies,[26] and at least three types of individuals are integrated into it. At the bottom of the corporative pyramid are the apprentices, dispossessed of physical resources to strike out on their own, but with increasing knowledge. They will become, therefore, the cognitive workers (6) par excellence of this period. The clerks succeed them in rank: having certificated skills and, usually, acquiring some

[26] Marx puts it thus:
The competition of serfs constantly escaping into the town, the constant war of the country against the towns and thus the necessity of an organized municipal military force, the bond of common ownership in a particular kind of labour, the necessity of common buildings for the sale of their wares at a time when craftsmen were also traders, and the consequent exclusion of the unauthorised from these buildings, the conflict among the interests of the various crafts, the necessity of protecting their laboriously acquired skill, and the feudal organization of the whole of the country: these were the causes of the union of the workers of each craft in guilds. (Marx and Engels 1970 [1846], 69)

tools, they will have a certain level of independence (5) that will make them equivalent to free proprietor peasants. At the top of the guild hierarchy will be, of course, the masters. Holding the title to craft knowledge and with the ability to exclude, they are the ancestors of the cognitive capitalists (2). Of course, the relative fluidity of movement between these areas of artisanship makes the separation of these groups into strictly separated classes unjustifiable. We are dealing with groups with often contradictory interests between and among them, but also with a series of vigorous instrumental and affective connections as well as the bonds of tradition.

But to understand the progressive transformation of feudalism into mercantile capitalism, it remains to observe the appearance of a key element: the merchant class. Given that exchange was geographically limited, confined to the city and its environs, those who would liberate it were destined to expand the world. Indeed, the merchant class of this period is characterized by handling physical resources in space, by transporting them towards itself and its commodities. This class still hasn't managed to make these materials and energies submit themselves to its domination in the factory (as the capitalists will); but it does manage to transport itself with them, ploughing the seas and oceans, bringing back marvels from the Orient and from the Indies.[27] Shaped by many factors, itself shaping others, it is through the action of this class, along with a multitude of other factors of course, that mercantile capitalism starts to take shape.

Before moving on, we here present a graphical summary (which seems static but should be understood in relation to the transformation we have suggested) of the social groups from the period we have discussed. The intended purpose of this is to arrange the stratification of social groups from this period in relation to the criteria proposed by this paper, emphasizing by visual means the existence of a determined hierarchy and its respective relationship to power. If, in turn, we were to think about the chart that represents the typology in an abstract way, we can observe that there are still no strictly capitalist classes and so category 1 would be empty. Note that in this chart we represent, to the left, the social groups distinguished by their access to PIR, while to the right we locate those that owe their status to their access to KIR.

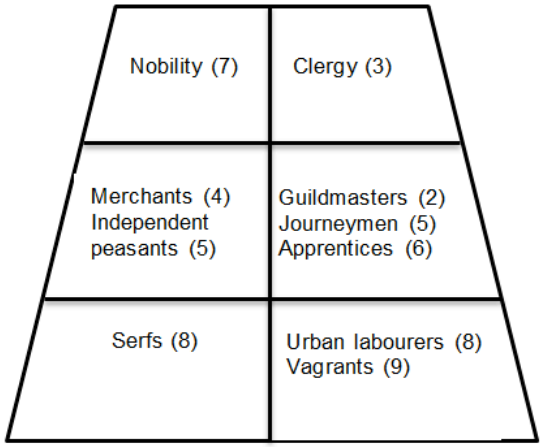

Table 2: Social classes towards the end of the feudal period (prepared by authors)

5. From Mercantile to Industrial Capitalism

Mercantile capitalism as a category is not clearly defined. Leaving to one side the clarifications that Sombart, Braudel and other authors introduce, it suffices here to note that the term

[27] It is tempting to paraphrase Marx and say that where mercantile capitalism takes shape we are facing a *formal* subsumption of physical resources, and that only when industrial capitalism makes its triumphal entry will this subsumption be *real*.

underlines the vigorous activity, or rather, the economic leadership of the mercantile groups (a kind of physical capitalists). More precisely, it aims to highlight the systematic and rational profit motive, which drives them. However, naming this period "capitalism" is a risky business, since the capitalist organization of production appears at the end rather than the beginning of the period. For our practical means, we will use the term mercantile capitalism to refer to the period between the decline of the feudal mode of production and the consolidation of industrial capitalism; roughly between the 15th and the middle of 18th centuries. In fact, rather than seeing it as being a period of stabilization of a new order, in our perspective it is more useful to understand it as a period of transition, of preparation of the forces that would lead to industrialism (although, clearly, this was not an inevitable result); in other words, as a period of primitive accumulation. In this period the clear division between capitalists and workers, with their respective varieties, took shape. At least five intertwining processes must be named: i) the privatization of the land, particularly through the process of *enclosure* of communal land; ii) the breaking up of the guild crafts; iii) the fall of the monarchic/feudal order; iv) the ascent of instrumental rationalism, especially around modern science; v) the emergence of intellectual property laws. Here we can only develop some of these, but the rest must not be overlooked.

The process of privatization of the land—the *enclosures*—that began in England between the end of the 15th century and the beginning of the 16th, was focused on the countryside, and was stimulated (in the case of England) by the blossoming of the wool industry. This process meant, above all, the eviction of the peasants who were previously relatively independent (5). These free peasants in some cases became the agricultural proletariat, rural workers, employed by the other class that, although it had existed in earlier epochs (Marx, 1909 [1867]), was now gaining strength: that of the landed proprietor, physical capitalists (4) who organize agricultural production with a view to attaining profit. This whole process, particularly the equalization of the landowners, was favored, among other factors, by the relationship between contracts stipulated by long terms (Marx suggests that 99 years was most common) at fixed prices, the depreciation of gold—occasioned by the arrival of vast quantities of the metal brought from the Americas—and the rise of cereal prices.

Of course, at the root of these expulsions, legal or not, violent or peaceful, lies the tendency of the nobility to became active rentiers, maximizing the profit they could obtain from their land (7), renting it to the free farmers instead of leaving it in the fallow economic state of the commons. As is well-known, the landed nobility did not only drag the collectively owned land into the world of commodities; they appropriated for themselves the land owned by the church and the monarchy at the same time as these institutions were losing power. Naturally, this process eroded not only one aspect, but the entire feudal order itself. The relations between lords and serfs, the organization of mercenary bands, the non-commercial bonds between subjects, etc., were inexorably dissolving. Regardless, here we are still in a transitional stage—thus the ambiguous term that gives its name to this sector: they still remain the nobility (we are not yet dealing with subjects that have attained their land in the clamor of the market); in the subsequent period they will simply be landowners.

But returning to the peasants freed both from feudal shackles and from the means of production, a large bulk of them could not be absorbed by agricultural production. It is precisely these masses who gave the impetus to capitalist manufacturing as Marx has shown in detail. That is, manual workers dedicated to more or less basic artisanal activities; but manufacturing workers after all, dependent on the means of production (especially on the raw materials) belonging to other social subjects: the manufacturing capitalists (4). These are a type of physical capitalist for the simple reason that their ability to exclude lays in the physical resources, and not in any knowledge they hold. In fact, these capitalists have no reason to possess any skills relating to the productive process, and in many cases are much more closely related to the merchant than to the master craftsman. Particularly at the beginning of the 18th century, these manufacturers assume the initial organization of capitalist production. They adopt, in general, the *putting out system*, a system in which workers produce in their own homes or in workshops without yet being placed under the direct control of the capitalist. Of course, this source of production contributed to and benefited from the blossoming growth

of the aforementioned commercial capitalists (4) who handled the buying and reselling of the manufactured goods. The development of this group is inseparable from a new group of rentiers: the mercantile financiers (a type of financial rentier) (3). This group is so significant that for some authors (Braudel 1985) it is their emergence that marks the beginning of capitalism. In any case, the fact of having originated in merchant capital does not impede the class that gave birth to it from transcending, or from establishing a relationship of control over other capitalist classes.

However, this is not enough to understand the transformation of classes in this period. On the one hand, it must be added to the map of knowledge intensive activities, which are usually urban. Within these, the most notable phenomenon is the progressive breaking up of craft guild organization. This process becomes effective in the subsequent period, through the well-known Le Chapelier Law in France (1791) and the Combination Acts in England (1799–1800). What falls apart, of course, is not so much the monopoly over certain knowledge—contrary to capitalist rationality—but the link, more contradictorily still, between guild masters, journeymen, and apprentices. The former, and perhaps the second too, established themselves as artisanal capitalists. The legal bearers of secret knowledge, possessors of specialist skills, they use that ages-old knowledge to set up workshops from which magical commodities now flow. In contrast, the old apprentices, but also some day-laborers arrived from the countryside managed to appropriate certain techniques, becoming artisanal workers (6).

That said however, the form in which the cognitive capitalists became holders knowledge which they unfairly retained was by means of securing patents, and much later on, of copyrights. Actually, in the period between 1474 (The Venetian Patent Act) and 1653 (The English Statute of Monopolies), positive regulations began to take shape—no longer concessions at the grace of the king, at least in theory—on exclusive and temporally limited rights over technical knowledge: patents. Starting from 1709–10 (The Statute of Queen Anne, in England) a particular type of intellectual property right over literary works would be defined, namely copyright.

Therefore, it is important to stress that the process of commodification of the land and other physical intensive resources takes place simultaneously with that process related to knowledge. In both cases, capitalist regulation of access appears, setting the boundaries of inclusions and exclusions. And in both cases these regulations open the way for divisions between subjects who do and don't have access to different types of resources. At the same time, there is another parallelism that contributes to the formation of the physical capitalist and cognitive capitalist classes: what happens to the monarchy—and to a certain extent to some of the aristocracy—with regard to physical resources, happens to the church with regard to knowledge. From having almost absolute control over these in the previous period, they now find themselves entangled in a series of battles that, increasingly, end in defeats. Some of those defeats are a consequence of the Protestant Reformation.[28] But the most significant are those associated with the rise of modern science, and in a more profound way, of instrumental rationality. We are not particularly interested here in the content of those scientific advances, but rather the fact that these effectively disputed the church's privileged claim to knowledge. The clerical class, as cognitive rentier, was wounded, and its European flock of faithful souls was proportionally reduced. However, the overseas conquests of the crown amply compensated for these defeats. Actually, in spite of the loss of the monopoly over cognitive resources and the emergence of other suppliers to the European market, the contribution of a large volume of "demanders" for Christianity contributed to maintaining the economic health of the clerical class.

[28] It is significant that one of the factors that precipitated the reform movement was the scandalous use of the cognitive monopoly: the sale of all kinds of indulgences, privileged seats in the celestial theatre, and other divine commodities.

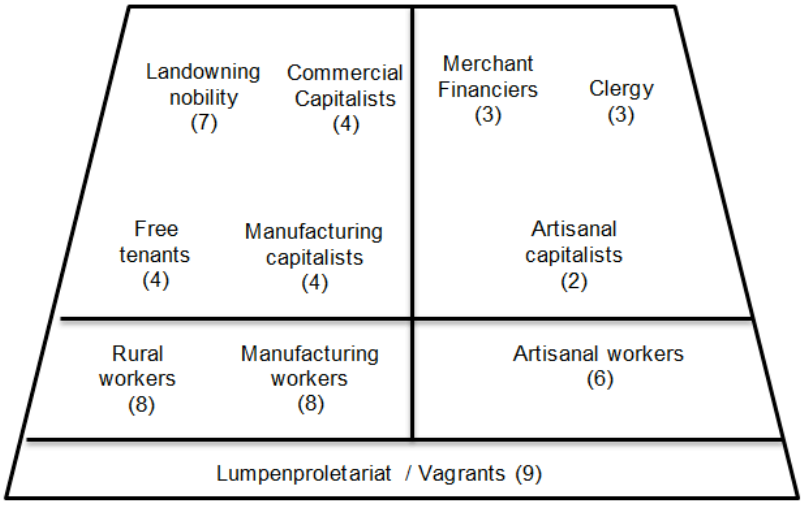

Table 3: Social classes in mercantile capitalism (prepared by the authors)

6. From Industrial Capitalism to Informational Capitalism

The analysis of the development of classes over this extended period requires, at least, a division. Firstly we will discuss the period between the first industrial revolution and the dissemination of Taylorism; a "long 19th century" that runs from approximately the last decades of the 18th century to the first decades of the 20th. Following this we look at the period from, approximately, the 1930s until the 1970s.

6.1. The Long 19th Century

Between the end of the 18th century and the first decades of the following century not only did a whole series of decisive revolutionary events take place, but also the most virulent economic transformation that humanity had ever witnessed: the industrial revolution (Hobsbawm 1988). Machines spread, man dominates raw materials and energies, productive processes are rationalized and the quest for profit plants its flag firmly into every summit. Capital and labor finished freeing themselves from their feudal ties, and the dichotomization between these classes becomes hardened. More specifically, industrial capitalism implies, above all, the antagonism between the industrial capitalists (4) and the industrial workers (8). This means, in both cases, subjects that profit—the former, or work, the latter, with different levels of access, and exclusion—to physical intensive resources.

Indeed, mechanized industry gradually destroyed in its path all possibility of competition from those sectors of physical and cognitive capital that didn't rise on the wave of the modernization of production, most of all in the urban environment, but also gradually in rural areas. So both small manufacturing capitalists, landowners and merchants as well as the small artisanal capitalists, in sum, the entire group of physical and cognitive capitalists from the previous stage, who yesterday fought against the feudal fetters, today merged into the great class of physical (industrial) capitalists. Others perished on the way, becoming a part of different elements of the mass of physical workers, and only some would manage to survive.

Thus, while in the cities the industrial capitalists progressively implemented mechanization and appropriated a large proportion of available raw materials, in the countryside the agrarian physical capitalists had to join the old nobility that acquired the form of modern landowner (7)—rentier par excellence of the current stage—following suit by taking for themselves a good part of the land.

In a parallel way, the industrial working class (8) (Marx 1909 [1867]; Coriat 2001)—the class of physical workers—expands its ranks at the same time as losing the monopoly over a significant part of its cognitive resources to capital. In fact, the introduction of machinery means, primarily, the transference and objectification of workers' knowledge into objects ca-

pable of being appropriated by capital (Marx 1857/58). As Coriat (2001) states, the manufacturing industry inevitably had to make use of people who held knowledge of production in order, later, to be able to take control of the results. The machine, in contrast, permitted this link to be skipped, as it imitated and systemized—by plagiarism rather than extraction (Zukerfeld 2010b)—the knowledge of the worker.

In this way, mechanized industry brings with it, on the one hand, the use of an unskilled labor force, utilizing the incorporation of women and children into the productive processes—"cheap labor" (Marx 1909 [1867], 504)—on the other hand it forces out a section of the labor force that would go on to form another section of this industrial working class, the so-called reserve army of labor, that only periodically participates in production.

A description centered on industrial workers must not obscure the fact that 'physical workers' includes many workers from the service sectors—that grow on a daily basis in the tumult of the large cities—such as messengers, transport workers, domestic workers and so on, as well as many others in rural areas. As a group, they all share the fact of working fundamentally based on their physical energy, assisting the knowledge stored up in the machines.

The totality of these movements will have as their result the brutal elimination of the class of self-employed workers (5), up until now made up of smallholding farmers and the independent craftsperson who had survived in the cities. This class of workers is extremely diminished in this period and will not swell in size again until well into the next period, principally with the influx of self-employed professionals.

However, although very inferior quantitatively speaking in this period, new classes of capitalists and cognitive workers begin to acquire a new dimension. It is accepted that still, and up until the second half of the 20th century, regulation of knowledge clearly differentiated between industrial creations—or economic goods, and artistic and literary spheres—or cultural goods.

In this way, we find, on the one hand, a modest kind of individual *inventor* connected to the industrial revolution (2), whose profits were based on the patenting of diverse types of machinery: James Watt and his steam engine; James Hargreaves and the Spinning Jenny; Richard Arkwright and the Water Frame; Samuel Crompton and his Spinning Mule are some examples. It would be years later, on the other side of the Atlantic, where this class would flourish.

In addition, another group of cognitive capitalist exists (2), dedicated to the artistic or literary spheres or that of cultural goods in general, incipient information industrialists. In fact books, newspapers and magazines, but also plays, etc., become a necessity for the cities, at the same time as the first laws of obligatory primary school education are passed, which little by little expand the market for the production and consumption of these goods.

Schools and the books that circulated at that time imbued increasingly more social sectors with varied types of knowledge, not least among them the values and norms of industrial society (Zukerfeld 2010b). Also the political and administrative class—the Weberian bureaucracies—teachers, architects and other professionals—working both for the States and for capitalist businesses—form part of this still nascent cognitariat, a group of intellectual workers (6). This stratum of capitalists and their workers represent a much larger number than the stratum of inventors, although not more important.

In summary, a group of intellectual workers at the service of a still modest but not inconsiderable cognitive capital (although also belonging to state organizations) slowly develops during the period under analysis. By the beginning of the 20th century we will find cognitive classes—capitalists and workers—already well developed.

Finally we must observe the enlargement of the excluded (9) sector. This is fed, in this period, by the lowest category in the Marxist reserve army of labor: pauperism. "Pauperism is the hospital of the active labor-army and the dead weight of the industrial reserve army" (Marx 1909 [1867], 707), and is composed of invalids, workers of a non-working age, the chronically ill, mutilated, etc, in sum, degraded people that, for the most part, have been dismissed from their own jobs. In this way pauperism, a typical feature of this epoch, joins the ranks of the lumpenproletariat of the previous period, which has not disappeared.

6.2. Maturation and Decomposition of Industrialism in the 20th Century

As we have indicated above, this period begins between the two World Wars and concludes with the global economic crisis of the mid-1970s. Generally speaking, the so-called Thirty Glorious Years constituted a period of stabilization of the salaried society, with the hallmark of the welfare state that, utilizing Keynesian policies, mediates capital-labor relations (Castel 2010; Coriat 2001; Hobsbawm 2011; Offe 1995). Of course, the period continues to be hegemonized by the industrial capitalists, as a concretion of the physical capitalists (4). However, it is appropriate here to mention some widely known transformations.

Firstly, in this period, the class of white-collar workers, as a prototype of cognitive workers (6)—technicians, professionals, scientists and administrators, but also politicians, teachers and workers in the entertainment industry—takes on an unusual quantitative leadership role (Mills 1969 [1951]; Lipset and Zetterberg 1963; Bell 1973). A significant proportion of them would find a home, naturally, in the service sector, which grows progressively in this period; but another, sizeable, portion would locate itself in the industrial sector, in the heart of the factories, in a context in which access to primary and secondary education continues expanding and in which college and university education begins to take off. This tendency is, in general terms, shared by all industrialized countries (Meyer and Schofer 2006; Windolf 1992; Barro 1991). In fact, the children of the working class now find themselves in a position to be able to abandon the family tradition of manual work, to join the ranks of the cognitive working class (Castel 2010), which means the shift of a substantial mass of workers from category (8) to (6).

But, we said, also within the factories. Actually, first Taylorism and then Fordism or the model of mass production which developed to complement it, had a serious impact on the productive processes and the nature of work, decreasing the presence of physical or blue collar workers (8) and increasing that of the cognitive workers (6). In this trajectory, the loss of the monopoly over productive knowledge that industrial workers had previously held took shape. Certainly, the scientific organization of labor produces transference of said knowledge, from the subjectivities of the workers into the codification of corporate property in procedural manuals. Later the assembly line and the conveyor belt would mean—as we had identified in the case of industrial machinery—the transference of the same to the machines, imposing a strict working rhythm onto the workers. Thus, while the diversification and increasing complexity of industrial productive processes advanced, work in the factories depended less and less on the physical energies of the workers and increasingly on machines and the knowledge of cognitive workers.

Secondly, in this period, many workers, above all of the cognitive variety (liberal professionals, Bell 1973), but also—although to a lesser extent—physical workers (taxi drivers, gas fitters, etc.), would converge in the class of self-employed workers (5). Although the growth of this class can be located, primarily, towards the end of the 20th century, we can observe that in the current period it has begun to slowly expand again.

Thirdly, the excluded (9) class is greatly reduced and re-signified thanks to the aforementioned welfare state. What we can call the marginalized class persists. The terms “marginal mass” (Nun 2003) or “marginal pole” (Quijano 1971), although with differences, refer to a mass of unemployed people who, both in urban and rural areas, seek refuge in subsistence activities such as waste collection, street selling etc. All are precarious activities that require only a negligible level of access to PIR and KIR, but that actually experience certain containment by the State (Castel 2010).

Fourthly, the cognitive capitalist class (2), as in the previous period, is still constituted by capitalists who profit from two different kinds of knowledge: those who profit from knowledge with an industrial application, and those who profit from artistic or literary works. The former and the latter, the stratum of inventors and individual authors identified previously, start to grow as corporate actors and to invest an ever increasing quantity of resources (in their R&D departments in the case of the former, see Drahos and Braithwaite 2004).

Thus, on one side the industry of radio, music, books, cinema and television, reaching mass audiences by the end of the period, ascends vertiginously. On the other, the chemical (with its diverse facets) and pharmaceutical industries boom as well.

Next, it should be noted that in this period, many of the aforementioned cognitive capitalists incrementally start to position themselves as the pure capitalist class (1) that is as cognitive and physical capitalists combined. The Ford Motor Company for example, starts to have its physical assets closely connected to the ownership of industrial property rights: brands, designs, patents. Or AT&T industries that on one side is based on an enormous quantity of patents and rights over telecommunications, and on the other on USD $5 billion worth of physical resources, and was the most capitalized company in the world in the 1930s (Johns 2009, 405–412).

Finally, in this period there is a development of the two types of rentier that merit a more detailed analysis than we will give here. Paradoxically, the most pertinent aspect is that they merge and to a certain extent become part of the same class, the analog financial rentiers (3 and 7). That means, the financialization of the economy by means of the mass expansion of shares, government bonds and other financial instruments, partially dilutes their origin of the assets. In the secondary market, the holders of these instruments don't differentiate if their rights pertain to cinematographic works or mineral resources. We label them with the adjective "analog" to highlight that their operations depend on technologies of processing and storing information of the following type: the telegraph and the telephone, paper and the typewriter, the pen and the banknote. This, of course, will change in the subsequent period.

7. Social Classes in Informational Capitalism

This section covers a period that begins halfway through the 1970s and takes us up to the present day.

The first classes that concern us here are, naturally, the cognitive workers and capitalists. These take the specific form of *informational* workers and capitalists (6 and 2). What do we mean when we refer to informational work? An activity in which the worker has a PC, Tablet, Netbook—or something similar—as a principal work tool and whose principal output in the productive process is an informational good that basically produces digital information (Zukerfeld 2013). Informational work has been measured particularly in the USA and it has been found that at the beginning of the millennium it already occupied the greater part of the work force (Apte and Nath 2007; Wolf 2006). Definitively, in its activity, access to physical ownership over the productive resource par excellence (digital technologies, with falling prices for a constant capacity) doesn't carry great costs or importance, except for their own cognitive resources applied during the productive process and now objectified in an informational good, regulated fundamentally by intellectual property.

An important point in relation to this type of worker—and that is related, among other things, to the ambivalence of their main instrument of labor—is that their cognitive resources, in contrast with the previous stage, aren't necessarily acquired in formal institutions, or rather, that these skilled workers don't necessarily have formal qualifications. The instrument of labor itself is a powerful tool for the incorporation of informal knowledge (through tutorials, videos, forums, etc.) In the same way, the previously mentioned ambivalence of this tool is manifested in its potential to construct networks of recognition, or social capital in Bourdieu's terminology (1985). At the same time, it is important to note that—unlike the workers of the previous stage, liberal professionals and physical workers in the service sectors—informational workers have a smooth path to freelance work (5). Certainly, the falling prices of the means of production such as the computer, is a defining factor. But not only that: the infrastructure that an informational worker requires (space, energy, devices of a different nature like modems, telephones, etc.) is easily assimilated into either the domestic environment itself or a less costly (in relative terms) space. Naturally, the conditions of the infrastructure, although in different proportions, are also modified in the case of companies.

In the capitalist sphere, the most profitable economic activities are concentrated in the exclusive form of intellectual property, but in addition, these are the most diverse: the pharma-

ceutical and biotechnology industry, the audiovisual and music content industry, software production and informatics services; all these productive areas come together in the stratum of informational capitalist (2), that is constituted as a hegemonic fraction of capital during this period. Said heterogeneity and unity corresponds, naturally, to the marriage that the institution of intellectual property had managed to consummate between knowledge with an industrial or technological application and artistic knowledge, that up until the decade of the 70s had not combined. Indeed, just as the access to goods regulated by private property loses significance in the face of access to knowledge for the informational worker, this type of capitalist is not concerned with monopolizing physical intensive resources, but rather, and above all, cognitive intensive resources. In this regard, Nike is a good example, not owning "a single factory, or machinery, equipment or real estate property" but only intellectual property (Rifkin 2000, 32).

That said, if a company like Nike represents the ideal type of informational capitalist, the case of the Ford Motor Company represents the ideal type of pure capitalist (1). Indeed, a significant layer of capitalists base their profits on patents, or more generically, on intellectual property rights over their products or parts of them and, at the same time, on the sale of these articles. So it is that Ford (but also Sony and others) own both factories and R&D laboratories. A particular characteristic that capitalists assume in this period is that if, to some degree, they need the industrial workers, they have a much greater need for the informational worker, and consequently their research departments. In fact, the product lifecycle is an important factor: the profits of these capitalists come much more from new and innovative products than from the prolonged sale of a standardized product.

The quantitative growth of informational workers takes place in a simultaneous—and complementary—way alongside the quantitative growth of physical workers, particularly a fraction of precarious manual workers (8) and the excluded (9), radically increasing the polarization between these classes (Castells 1999; Rifkin 2000; Zukerfeld 2010a; Fuchs and Sandoval 2014). The well-known fact that Nike´s subcontractors utilize child and semi-slave labor to lower their costs points to this relationship between, informational capitalists and workers on the one hand and precarious manual workers, on the other (Rifkin 2000, 75). This is a stratum of "vulnerable" physical workers (Castel 2010) concentrated in the marginal elements of the productive processes, although not completely excluded from them. In contrast, the excluded (8) (Castel 2010; Nun 2003), in the present stage take the concrete form of the chronically unemployed and structurally impoverished. This social class, unlike the vulnerable group, "are superfluous, they are not needed" (Nun 2003), but they also manifest an unusual quantitative explosion (Castells 1999). Naturally, the watershed between these two classes is very diffuse. Although nation states in different locations and decades adopt varying attitudes regarding these sectors, the most pertinent difference compared with the previous period is that the capitalist productive processes make do without them. Thus, whether we're dealing with subsidized poor or those completely without assistance, the productive apparatus experiences them more as a dead weight than as a source of energy.

Lastly, it remains to emphasize that digitalization increases global integration of the cognitive and physical rentiers, between sectors and nations. No longer are there analog rentiers, but rather *digital rentiers* who deal in informational goods. Of course, the possibilities of an acceleration of the monetary multiplier which digital technologies bring are huge, and encourages "rentierism" to move rapidly from one productive sector to another.

		Access to Physical Intensive Resources		
		Exclusive	Non-exclusive	No access
Access to Knowledge Intensive Resources	Exclusive	1.Capitalists	2. Informational Capitalists	3. Digital Rentiers
	Non-exclusive	4. Industrial Capitalists	5. Self-employed (Informational and not)	6. Informational Workers
	No access	7. Digital Rentiers	8. Precarious Manual Workers	9.Excluded

Table 4: Social classes in informational capitalism (prepared by the authors)

8. Conclusions

This paper has attempted to put into motion a series of new categories. Here at the end of our trajectory we consider it appropriate to point out some of its limitations. Indeed, to be able to give an account of the historical and conceptual exercise which we have attempted, we have evaded a whole series of important debates. For example, we did not engage with other theories about *class* and we only mentioned in a very incomplete way which ideas we have borrowed from those theories and which not. We have not included any a review of the literature about social stratification and our historical references have been brief, simplistic and overly accommodating. Likewise, we have avoided the issue of exploitation, its different kinds according to cognitive materialism and its links with social classes. With these and other issues we have treated certain questions as axiomatic when in fact they should instead have been presented as hypotheses, given that they are open to many alternative perspectives. However, this has been a consequence of choice rather than absolute necessity. We do not abnegate the task of engaging in quotations, interpretations and research critiques; in fact it is an activity that we do occasionally practice and that we will return to in some future, more extended, version of this paper. Nevertheless, in this instance we preferred to concentrate on outlining a proposal, rather than tracing the divisions and contours of the arguments proffered by others. A proposal that, with all its limitations, seems applicable to different historical situations. Whether it is able to do so effectively is for the readers of this paper—and future, more specific papers—to judge.

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