THE COMMODIFICATION OF KNOWLEDGE AND INFORMATION

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Abstract

In this chapter we present an analysis of the commodification of knowledge and information in contemporary capitalism. We provide a consistent account of how information as a commodity effects the workings of both capitalism and of Marxist theory. The first part of the chapter critically revisits Marx's own writings on the commodification of knowledge and how the immaterial labor hypothesis initially interpreted these writings. Based on the new categories *knowledge-commodity* and *knowledge-rent*, we then present our own approach in response to the challenges raised by the immaterial labor hypothesis. Lastly, we analyze the more recent contributions on the commodification of knowledge and information within the Marxist literature. The current debate on the value of knowledge has been divided between two camps: the reproduction cost approach, and the average cost approach. At the end of the chapter we present empirical estimates of the magnitudes of knowledge-rents.

Key-words: knowledge-commodities, knowledge-rents, value theory, Marx, immaterial labor[1]

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Introduction

The commodification of knowledge and information has been an undeniable feature of our economic system. Copyrights, patents, and intellectual property rights have proliferated worldwide in the past decades (OECD 2013). The commodity form thus appears to spare nothing and no one.

At every point in time in the history of capitalism when the commodity form took hold of a new economic object, a profound transformation would ensue. When the commodity form took hold of land, capitalist *land rents* emerged. When the commodity form took hold of labor power, wage labor and *wages* emerged. When the commodity form took hold of capital, *interest-bearing capital* emerged. Now we claim that when the commodity form took hold of knowledge and information, *knowledge-rents* emerged.

In this chapter we present an analysis of the commodification of knowledge and information in contemporary capitalism. Our approach aims primarily at developing Marxist theory so that it can face the new challenges posed by the existence of commodified information. In the 19th century Marx himself developed some deep insights on the future of science and information as productive forces within capitalism. Marx, however, had not yet experienced the vast and profound commodification of knowledge we experience nowadays. This fact bears consequences for the Marxist tradition, and it is our current task to provide a consistent account of how information as a commodity effects the workings of both capitalism and Marxist theory.

The structure of the chapter is as follows. First, we will critically revisit Marx's own writings on the importance of knowledge in production and how the immaterial labor hypothesis initially interpreted these writings. In revisiting Marx's insights on the roles of science and the "general intellect" we will be able to see how he foresaw the production and distribution of wealth in a future stage of capitalism. The immaterial labor hypothesis originally raised the argument that capitalism has been going through a structural shift by relying ever more on immaterial commodities produced during non-labor time. The hypothesis of a supposed change in the nature of both labor and commodities began to question abstract labor as the substance of value, and as a consequence called into question the analytical validity of Marx's value theory.

Second, we present our own approach in response to the challenges raised by the immaterial labor hypothesis. We introduce new Marxist categories with the explicit purpose of theorizing the emergence of commodified information: *knowledge-*

commodities with zero value, *knowledge-rents*, and *knowledge-lords*. Crucial to our argument is Marx's distinction between production and reproduction time, and between productive and unproductive activity. Our own approach, we claim, coherently integrates Marx's value theory with the transformation of knowledge and information into commodities.

Third, we analyze the more recent contributions on the commodification of knowledge within the Marxist literature. The current debate on the value of knowledge is divided between two camps: the reproduction cost approach (of Teixeira and Rotta), and the average cost approach (of Starosta and Fuchs). The reproduction cost approach claims that commodified knowledge tends to have zero value because of its costless reproduction. The average cost approach, on the contrary, claims that commodified knowledge has value and that its value is given by the initial expenditures necessary to produce it. We argue that the reproduction cost approach is theoretically superior to the average cost approach, as only the zero-value interpretation is consistent with the notion of moral (i.e. value) depreciation. We also present empirical estimates of the magnitudes of knowledge-rents, and then conclude the chapter with final remarks on artificial intelligence and the limits of the Marxist theory of value.

Cognitive capitalism and the immaterial labor hypothesis

In an insightful passage in the 1857-1858 *Grundrisse*, a passage that did not reappear afterwards in any edition of *Capital*, Marx has an intriguing comment on the impact of technology and science on the limits of value as the form of wealth in capitalism. He explicitly posits that labor time is the measure of value. But then acknowledges that technology and science applied to production progressively render labor time a miserable measure of wealth. It is a lengthy passage but well worth quoting in full:

> But to the degree that large industry develops, the creation of real wealth comes to depend less on labour time and on the amount of labour employed than on the power of the agencies set in motion during labour time, whose "powerful effectiveness" is itself in turn out of all proportion to the direct labour time spent on their production, but depends rather on the general state of science and on the progress of technology, or the application of this science to production. […] Real

> wealth manifests itself, rather – and large industry reveals this – in the monstrous disproportion between the labour time applied, and its product, as well as in the qualitative imbalance between labour, reduced to a pure abstraction, and the power of the production process it superintends. […] In this transformation, it is neither the direct human labour he [the worker] himself performs, nor the time during which he works, but rather the appropriation of his own general productive power … which appears as the great foundation-stone of production and of wealth. The *theft of alien labour time, on which the present wealth is based,* appears a miserable foundation in face of this new one, created by large-scale industry itself. As soon as labour in the direct form has ceased to be the great well-spring of wealth, labour time ceases and must cease to be its measure, and hence exchange value [must cease to be the measure] of use value. […] Capital itself is the moving contradiction, [in] that it presses to reduce labour time to a minimum, while it posits labour time, on the other side, as sole measure and source of wealth. Hence it diminishes labour time in the necessary form so as to increase it in the superfluous form; hence posits the superfluous in growing measure as a condition – question of life or death – for the necessary. On the one side, then, it calls to life all the powers of science and of nature, as of social combination and of social intercourse, in order to make the creation of wealth independent (relatively) of the labour time employed on it. On the other side, it wants to use labour time as the measuring rod for the giant social forces thereby created, and to confine them within the limits required to maintain the already created value as value. […] The development of fixed capital indicates to what degree general social knowledge has become a direct force of production, and to what degree, hence, the conditions of the process of social life itself have come under the control of the general intellect and been transformed in accordance with it. (Marx [1858]1973:705-706 – emphasis in the original)

This passage from the 1857-1858 *Grundrisse* was unknown to readers until its publication in 1939. In the 1990s it then became the basis for the *immaterial labor* hypothesis of André Gorz, Toni Negri, Michael Hardt, and Maurizio Lazzarato. The core idea of this hypothesis is that technological progress makes labor time an inadequate measure of value, for the "general intellect" depends ever more on what is produced during non-labor time. These authors identify the "transformation" that Marx alludes to

as the transition from an industry-based to a service-based economy. This transition from industry to services is, in their understanding, the limit to value theory grounded on labor time.

Negri (1991), Hardt and Negri (2001; 2004) and Lazzarato (2006) have put forth the argument that *immaterial labor* has modified the forms under which capitalist production takes place. Immaterial labor, they claim, produces *immaterial products* such as knowledge, information, ideas, images, affection etc. The qualities and specific characteristics of immaterial production tend to transform the labor process and even society itself as a whole. In contrast to agriculture and industry, immaterial labor emerges in the service sector and does not produce tangible goods. Immaterial labor blurs the distinction between *work* and *non-work time* and changes the nature of labor time from quantitative to qualitative.

Gorz ([2003] 2010) developed a similar set of ideas under his notion of *cognitive capitalism*. According to Gorz, current production relations are more tied to the complex and unmeasurable dimensions of human capital than to the former tangible forms of fixed capital. This replacement of fixed capital by human capital occurs because capitalism has gradually subordinated to the profit motive the knowledge, the science, and the arts developed during *non-work time*. Gorz ([2003] 2010) also differentiates between the present post-Fordist worker and the former industry worker still attached to the assembly line. The worker typical of Fordism is an appendix to material production and its work time is measured in hours of repetitive physical effort. The post-Fordist worker, on the contrary, is known for the qualitative aspects of its labor, for its knowledge and skills, for its behavior and improvisation, for its imaginative and cooperative capabilities mostly nurtured outside of the workplace.

The main argument that Hardt, Negri, Lazzarato, and Gorz have raised against Marxist value theory is that *abstract labor is no longer the substance of value*. The profound changes that immaterial labor has introduced into the nature of labor and production ended up displacing labor time as the internal regulating mechanism of capitalism. Immaterial labor, these authors claim, creates immaterial commodities whose values cannot be measured by the labor time required for their production. The valorization of value now depends less on unpaid labor time and hence more on the scientific knowledge and skills developed during *non-labor time*.

Along similar lines, Paulani (2001), Fausto (2002), and Prado (2005) have suggested that present-day capitalism is developing under the *post-large industry* form,

in reference to a "third moment" that succeeds manufacturing and the large industry that Marx theorized in *Capital*. The crucial feature of post-large industry is that knowledge itself becomes a core engine of production. As capital increasingly makes labor time a poor measure of value, it modifies the way in which capital subjugates labor within and outside the production process. If previous forms of capitalism led to the *formal* and *real* subordination of labor to capital, capitalism now achieves a higher stage with the *intellectual subordination* of labor to capital. More recently, Virno (2007) and Vercellone (2007) have also developed the idea that in cognitive capitalism the general intellect operates as a sublation of the real subordination of labor to capital[2].

The concept of immaterial labor poses a theoretical challenge to Marxist theory. If abstract labor is no longer the substance of value then value has lost both its internal measure in labor time and its role in regulating production and exchange. One crucial consequence of value losing its internal measure in labor time is that the price system becomes more arbitrary and dependent on non-economic factors such as monopoly rights.

In the next section we address these concerns and show how it is possible, and logically consistent, to remain within the Marxist theory of value while concomitantly acknowledging the recent transformations in capitalism.

Knowledge-commodities and knowledge-rents

In a more recent analysis, Teixeira and Rotta (2012), Rotta and Teixeira (2016), and Rotta (2018) propose a solution to the theoretical challenge inherent to the concept of immaterial labor. In these studies we conceptualize the role of commodified knowledge but we do so *within* Marx's value theory, without rejecting abstract labor as the substance of value.

In this regard it is crucial to distinguish between *production* and *reproduction* in the determination of value and socially necessarily labor time. Marx begins *Capital* at a very high level of abstraction, a stage in his theoretical exposition at which we only find the *production* of commodities. Growth, reproduction, and inter-capitalist competition are not yet explicitly (even though they are implicitly) included in the analysis[3]. But as

[2] See Smith (2013) for a critique of Virno and Vercellone and also for a further critique against the immaterial labor hypothesis for not properly considering the distinction between *wealth* and *value* in Marxist theory.

[3] Fausto (1987a; 1987b) theorizes this distinction between *implicit* and *explicit*, or between *presupposed* and *posited* determinations as Marx moves from more abstract to more concrete levels of analysis.

soon as Marx approaches a more concrete level of analysis he progressively introduces the conditions of capital *reproduction*. At this point, once reproduction comes to the forefront of the theoretical exposition, there begins an important shift within Marx's value theory.

At the initial higher level of abstraction, in which only production is featured, commodity *production* determines the magnitude of values. But once reproduction is explicitly brought into the picture at a more concrete level of analysis, value is then determined by the conditions of commodity *reproduction*. The Marxist theory of value is fundamentally reliant on the difference between the production and the reproduction of commodities. Because of its undue focus on the very first chapters of *Capital*, the Marxist tradition has misunderstood how reproduction (not production) determines value and socially necessary labor time.

Once the reproduction of capital is explicitly brought into the analysis, Marx posits that what determines the value of any commodity is *not* the socially necessary labor time required for its production but the socially necessary labor time required for its *re*-production.

For example, from *Capital I*:

> But in addition to the material wear and tear, a machine also undergoes what we might call a *moral depreciation*. It loses exchange-value, either because machines of the same sort are being produced more cheaply than it was, or because better machines are entering into competition with it. In both cases, however young and full of life the machine may be, *its value is no longer determined by the necessary labour-time actually objectified in it, but by the labour-time necessary to reproduce either it or the better machine*. It has therefore been devalued to a greater or lesser extent. (Marx [1887]1990:528 − emphasis added)

From *Capital II*:

> Just as with any other commodity, so in the case of labour-power, too, its value is determined by the amount of labour needed to *reproduce* it. […] wages are the value of the commodity labour-power, and the latter can be determined (like the value of any other commodity) by the labour needed for its *reproduction*. (Marx [1893]1992, p.458-459 − emphasis added)

In *Capital III* Marx pointed to "the great difference in costs between the first construction of a new machine and its reproduction" ([1894]1994:199), and then claimed that:

> Once machines, factory buildings or any other kind of fixed capital have reached a certain degree of maturity, so that they remain unchanged for a long while at least in their basic construction, a further *devaluation* takes place as a result of improvements in the *methods of reproduction* of this fixed capital. The value of machines, etc. now falls not because they are quickly supplanted or partially devalued by newer, more productive machines, etc., but because they can now be *reproduced more cheaply*. (Marx [1894]1994:209 − emphasis added)

> Fluctuations in the rate of profit that are independent of changes in either the capital's organic components or its absolute magnitude are possible only if the value of the capital advanced, whatever might be the form - fixed or circulating - in which it exists, rises or falls as a result of an increase or decrease in the *labour-time necessary for its reproduction*, an increase or decrease that is independent of the capital already in existence. The *value of any commodity* - and thus also of the commodities which capital consists of - is determined *not* by the necessary labour-time that it itself contains, but by the *socially necessary labour-time required for its reproduction*. This *reproduction may differ from the conditions of its original production* by taking place under easier or more difficult circumstances. (Marx [1894]1994:237-238 − emphasis added)

> Apart from all the accidental circumstances, a large part of the existing capital is always being more or less *devalued* in the course of the reproduction process, since *the value of commodities is determined not by the labor-time originally taken by their production, but rather by the labor-time that their reproduction takes*, and this steadily decreases as the social productivity of labor develops. At a higher level of development of social productivity, therefore, all existing capital, instead of appearing as the result of a long process of capital accumulation, appears as the result of a relatively short *reproduction period*. (Marx [1894]1994:522 − emphasis added)

In the case of commodified knowledge, Marx's reasoning is pushed to its limit: once initially produced as commodities, knowledge and information tend to require no labor time to be further reproduced. They become *knowledge-commodities with zero value* and the ownership of them gives rise to *knowledge-rents*. Examples of knowledge-commodities are all sorts of commodified data, computer software, chemical formulas, patented information, recorded music, copyrighted compositions and movies, and monopolized scientific knowledge. Mokyr (2002) prefers to call it the "useful knowledge" of information, techniques, and instructions stored in technical artifacts.

The owners of commodified knowledge, which are mostly private companies, are *knowledge-lords*, the primary appropriators of knowledge-rents. In a process analogous to the original enclosures of the commons in the 16th century we can now speak of the "new enclosures" that privatize knowledge. The new enclosures of the 21st century deny labor the free access to knowledge as much as the 16th century enclosures denied labor the access to free land (the commons) as a means of production.

Because it produces no new value, the creation and ownership of commodified knowledge is actually an *unproductive* form of capital accumulation (Rotta 2018). *Productive activities* are those activities that create new surplus value, while *unproductive activities* are those that do not create new surplus value. Because knowledge and information can be reproduced without any labor, its production generates no value and hence no surplus value, and must therefore be classified as unproductive activity.

A knowledge-commodity is, in all cases, a commodity. It has value and use-value as its social determinations. But *quantitatively* this value is zero, because the measure of value is the (zero) labor time necessary to reproduce the commodity. The knowledge-commodity does not lose value as one of its determinations, otherwise it would cease to be a commodity in the first place. It is thus more accurate to speak of *knowledge-commodities with zero value* than of *valueless knowledge-commodities*, even though we employ these two terms interchangeably. This is somehow analogous to a situation in which the temperature of an object is zero degree Celsius. The temperature as a property (physical, not social in this analogy) of the object is present, as the kinetic energy of its constituent particles, even though quantitatively the temperature on the Celsius scale is zero.

A corollary of the above reasoning is that what Hardt, Negri, Lazzarato, and Gorz labeled as "immaterial labor" belongs mostly to the *unproductive* side of capitalism.

Commodified knowledge and information have no value and hence cannot contain any surplus value. The profits that accrue to knowledge owners are knowledge-rents that represent value drawn from other value-producing activities in the economy. This is consistent with Marxist value theory and thus cannot be an argument favoring the dismissal of labor time as the measure of value.

The main theoretical misunderstanding of those who advocate the end of Marx's theory of value is that they have not properly conceptualized the difference between production and *re*-production time, and neither the difference between productive and unproductive activity. Even though the language is not completely clear, Marx gave us a hint of this reasoning:

> [The] product of mental labor – science – always stands far below its value, because the labor-time needed to reproduce it has no relation at all to the labor-time required for its original production (Marx [1863]1988:Addenda to Vol. 1).

> Once discovered, the law of the deflection of a magnetic needle in the field of an electric current, or the law of the magnetization of iron by electricity, cost absolutely nothing. […] Science, generally speaking, costs the capitalist nothing, a fact that by no means prevents him from exploiting it (Marx [1887]1990:508).

In *Capital III* Marx then considers the existence of use-values that require no labor to be reproduced:

> [The] use-value is the general bearer of the exchange-value, but not its cause. If the same use-value could be created without labor, it would have no exchange-value, yet it would have the same useful effect as ever (Marx [1894]1994:786).

It is, nonetheless, crucial to distinguish between the knowledge-commodity itself and other tangible and non-tangible commodities that it might be attached to. In certain cases the knowledge-commodity is traded (sold or licensed) per se. Examples are when customers and companies purchase the license to use software, or when a company pays the royalties required to use a specific drug formula. But in other cases the knowledge-commodity can only be traded if bundled together with another commodity. This situation

leads to a potential theoretical confusion if we do not properly distinguish the knowledge-commodity itself from the other commodities bundled together with it.

A few examples might clarify this instance. When a band performs a live concert its fans must pay for the entrance tickets. The ticket price covers the costs of all the inputs used such as the musical and technical equipment necessary for a live concert. The ticket price also covers the compensation of the productive labor of the musicians performing live to the public. However, the musicians are playing copyrighted compositions, and this is where the knowledge-rents arise. The copyrighted songs are knowledge-commodities and a share of the concert revenues are actually payments for the knowledge-rents associated with these songs. Hence, what we call a concert is in fact a bundle of several commodities, among them knowledge-commodities like musical compositions. The live performance is a combination of the *productive* labor of musicians and technical staff, plus the *unproductive* labor of those who composed the songs in the first place. If recorded, the video of the concert itself can be sold afterwards as a knowledge-commodity with zero value in a DVD or via Internet streaming.

When you buy a smartphone, part of the phone price covers the production costs of the physical components. But another part of the price remunerates the patented design and the copyrighted software stored in the memory. The copyrighted parts of the phone are therefore knowledge-commodities, and the revenues associated with these specific components are knowledge-rents. This implies that your smartphone is in fact a combination of more than one commodity. A share of the phone price pays for the *productive* labor of those workers making the physical components. Another share of the phone price pays for the knowledge-rents, out of which the knowledge-lords pay for the *unproductive* labor of those workers making the design and the software[4].

Even fixed capital in the form of machines and equipment are combinations of different commodities. Suppose that a company takes ten years to develop a new type of machine capable of performing a very precise process. The physical machine does need labor time to the reproduced, and hence it contains value. But the copyrighted design and the copyrighted blueprint of the machine are the knowledge-commodities inherently attached to the machine itself. The same goes for any software used to operate this

[4] Kraemer, Linden, and Dedrick (2011) estimate the production costs of iPhones and iPads in 2010. They find that the cost of physical materials in the iPhone 4 represents only 22% of the final retail price, while labor costs amount to only 5.3%. They do not, however, attempt to estimate the size of the knowledge-rents.

machine. This copyrighted knowledge is the knowledge-commodity that gives rise to knowledge-rents. Therefore, knowledge-commodities and knowledge-rents are present even in fixed forms of capital like machines and equipment. The physical part of this fixed capital suffers both use-value depreciation and value (moral) depreciation, such that the machine gradually transfers (and hence loses) its value to the output. But the copyrighted part of this fixed capital does not have value and the payments associated to it are knowledge-rents.

The knowledge-commodity is *not* a commodity that is knowledge-intensive. The knowledge-commodity is *not* the technical artifact in which information is stored. The knowledge-commodity *is* the commodified information itself. For example, take the case of pharmaceuticals. A pill (the tangible drug) is *not* a knowledge-commodity. The knowledge-commodity is the information that allows the company to make the drug in the first place. The information that allows the pharmaceutical company to make the drug is a commodity because this useful information was produced with the explicit purpose of making a profit. Hence, this information is commodified. But because commodified information has zero value, it gives rise not to surplus value but to rents. For the knowledge-commodity to have zero value, we do not even need to wait until another competitor company can reproduce this drug at zero labor time. The pharmaceutical company that paid for all the initial sunk and fixed costs of research and development can itself already reproduce this commodified information at zero labor time. For a knowledge-commodity to have zero value is not necessary that competitors replicate it. The innovating company that created the knowledge-commodity in the first place can already reproduce this commodified information indefinitely, regardless of what its competitors do.

Marx's theory of ground rent related only to agriculture and mining (Fine 1979; Harvey 2006:349-357; Rigi 2014; Basu 2018). But we can now draw on his insights to claim the existence of four categories of knowledge-rents:

(i) **Monopoly Rent:** Because of intellectual property rights the owner of information is able to price (the use of) its knowledge-commodities above their zero value, hence extracting a monopoly rent from its users. The intellectual property rights transform a non-scarce commodity into one that is artificially scarce. The monopoly rent exists regardless if the user of the knowledge-commodity is a final consumer or a company using it as an input. If the owner of the knowledge-

commodity sells not its use rights but the actual ownership, then the price of the knowledge-commodity is the discounted expected stream of future knowledge-rents.

(ii) **Differential Rent type I (DR-1):** Each knowledge-commodity gives rise to different levels of productivity for the companies using them as inputs. If certain companies use a particular software to enhance their productivity, these privileged companies will obtain DR-1. The software gives them a concrete productive differential. This is analogous to lands with different levels of fertility. But if all companies use the same software, the productive differential is eroded and DR-1 ceases to exist. Note that software need to be upgraded constantly but, in any case, each upgraded version is a new knowledge-commodity with zero value.

(iii) **Differential Rent type II (DR-2):** Companies using knowledge-commodities as inputs do so but with different amounts of capital. If the organic composition of capital or the amount of capital invested across companies that use the software are not the same, even if all of them use the same software, DR-2 will emerge.

(iv) **Absolute Rent:** Absolute rent would exist only if knowledge-commodities had value and were produced within a specific sector protected by intellectual property rights and with a lower organic composition of capital then the rest of the economy. Unlike monopoly rent, which draws from the global pool of surplus value, absolute rent draws from the surplus value in a particular sector of production, like land rents in the agricultural sector. Because these conditions are not satisfied in the case of knowledge-commodities, absolute knowledge-rents are implausible.[5]

As Teixeira and Rotta (2012) and Rotta (2018) demonstrated, it is empirically verifiable that present-day capitalism is indeed becoming more dependent on the existence of rents such as land-rents and knowledge-rents. In fact, the expansion of unproductive activities and of rentier forms of capital is exactly what Marx had theorized and foreseen in the development of capitalism. There is still no need to reject labor as the substance of value and hence no need to reject the Marxist theory of value. On the

[5] Zeller (2008) and Teixeira and Rotta (2012) had originally claimed that absolute knowledge-rents could exist, but Rigi (2014) correctly pointed out that absolute rents are not a constituent part of knowledge-rents: "the surplus value that is transformed into patent rent is not produced in the knowledge sector … knowledge has no value, and, therefore, the knowledge sector does not produce surplus value at all. This surplus value is produced outside the knowledge sector".

contrary, the rise of rentier activities and of other types of unproductive activity is exactly what Marx had conceptualized through his notion of *value autonomization* (Rotta and Teixeira 2016).

In the next section we turn to the more recent developments in the Political Economy literature regarding the roles of knowledge and immaterial labor.

The commodification of knowledge and information: the recent literature

The Political Economy literature on the commodification of knowledge and information has been growing steadily in the past decades. At the present moment the scholarship is divided between two camps in regard to the determination of the value of commodified knowledge. The *reproduction cost approach* posits that commodified knowledge tends to have zero value, and that knowledge-rents are appropriations of the global pool of surplus value in the economy. The *average cost approach*, on the contrary, posits that the initial investment necessary to create commodified knowledge (the research and development costs to produce the "mold") determines the value to be realized once the knowledge-commodity is sold or licensed. In this section we highlight the advances made in this debate. Our understanding is that the reproduction cost approach is theoretically superior to the average cost approach because it is the only one that is consistent with the notion of moral (i.e. value) depreciation.

Foley (2013) draws from the Classical Political Economy distinction between productive and unproductive activities to claim that commodified information contains no value and that its ownership gives rise to intellectual property rents. The unique feature of commodified information is that, unlike the case of land rents in which the same soil can be used for only one crop at a time, the same piece of information can be used by multiple parties concomitantly. Unlike land, knowledge is non-rival and hence its owner can extract rents multiple times over from costless copies of the same commodity. These rents, Foley argues, are part of a pool of surplus value generated in capitalist production though they have no direct relation to the exploitation of productive workers in themselves. The production of knowledge and the associated intellectual property rights allow unproductive capitalists to grab a share of the global pool of surplus value without directly contributing to it. Foley also notes that despite being classified as an unproductive activity, knowledge creation can indirectly raise the productivity of labor in productive activities.

On this same issue, Foley has a very good passage on how the creation of surplus value is actually an unintended by-product of the struggle to appropriate (not necessarily to produce) surplus value. Which implies that, in capitalism, economic growth is an unintended by-product of the pursuit of profits:

> [The] global pool of surplus value emerges from the social relations of capitalism as an unintended by-product of the competition to appropriate surplus value. Its magnitude is an emergent and contingent phenomenon beyond the influence of any individual capitalist, responsive only to broad political, cultural, and social factors. The immediate competitive challenge for all capitals is the appropriation of a larger share of this pool of surplus value. Some modes of appropriation indirectly contribute to increasing the size of the pool of surplus value, but many, including a wide variety of methods of generating rents, do not. There are some self-correcting mechanisms built into the social relations of capitalism ... If, for example, capitalists relentlessly shift capital from the generation of surplus value to the unproductive pursuit of the appropriation of surplus value, sooner or later profit rates in productive sectors will rise and profit rates in unproductive sectors will fall, according to the general law of competition (Foley 2013:261).

Jeon (2011) further notes that in the Marxist tradition in South Korea there has been an intense debate between those who think that knowledge-commodities have value and those who think otherwise. Among those who believe that knowledge-commodities have value, the main argument is that the fixed capital and all the costs behind the production of the very first unit (the "mold") must be taken into account into the unit values of the output. Hence, if this hypothesis is correct, the value of knowledge-commodities is the average cost per unit produced inclusive of all sunk and fixed costs. Given the large expenditures with machinery, laboratories, and research and development that need to be spread out across all copies sold, the average cost of knowledge-commodities cannot be zero. But such an approach ignores Marx's value theory grounded on reproduction time. As we have seen in the last section, Marx was very explicit about the fact that reproduction, not production, determines the value of any commodity. Jeon (2011) also notes that in the group of Korean scholars that identify with the hypothesis that knowledge-commodities have zero value, there has been a convergence toward the idea that intellectual property rights do imply the existence of information rents.

Starosta (2012) and Fuchs (2015) also disagree with the notion that knowledge-commodities have zero value. These authors believe that value is determined in a similar way to average costs. And because average costs are the total costs (inclusive of fixed costs like plants and equipment) divided by the output, the value of knowledge-commodities is not zero. Starosta warns against attempts of determining the values of commodities taken individually:

> [The] determination of the value of the individual commodity can no longer be considered in isolation but must be directly posited in its organic relation to the mass of commodities whose unity embodies the valorization of the capital invested. […] the total value is determined "first" and then shared out equally by each individual commodity, which now contains a proportional fraction of the former. […] the real determination of value actually transcends the isolated single commodity as such. […] Inasmuch as each single commodity embodies an equal fraction of the value of the product of capital as a whole, the comparison between the (exceptionally high) cost of production of the first article and (exceptionally low) cost of reproduction of the rest is rendered meaningless as far as their value-determinations are concerned. […] intellectual property rights do not force the exchange-value of software above its insignificantly small (or nonexistent) value … but mediate its full realization. […] In this sense, there is no essential difference between cognitive commodities and "physical" ones beyond the aforementioned technicality of extending the legal regulation beyond the act of exchange proper and into the conditions of use (Starosta 2012:373-376).

Starosta argues that the total value of the entire output must be divided across each unit produced. This average cost approach to the determination of value is therefore an attempt to remain within the boundaries of Marx's value theory, while at the same time rejecting the claims that Marx's value theory has become obsolete in cognitive capitalism. Starosta cites passages from *Capital*, mostly drawn before Marx explicitly introduces reproduction into the analysis, to corroborate his perspective. But ignores those that contradict his claims. What determines the value of any commodity is the labor time required to reproduce it. And this reproduction time bears no relation with the labor time originally required to create the commodity in the first place.

Marx's value theory based on reproduction time and, consequently, on moral depreciation (the change in the values of the existing stock of commodities) is much more nuanced than a simple average cost approach. The determination of value based on the socially necessary labor time to reproduce a commodity is, in fact, similar to current cost accounting practices. A closer inspection of Marx's quotes in the previous section of this chapter shows that *moral depreciation*:

(i) Is the loss of value that, abstracting from the physical wear and tear (the *use-value depreciation)*, impacts the stock of all commodities, including those that have already been produced in the past;

(ii) Can occur because of the existing reproduction methods on the supply side, and also because of changes on the demand side;

(iii) Can occur because reproduction time takes into account the immediate effects of *new technologies* on the obsolescence of already existing technologies;

(iv) Can occur because of economies of scale that reduce reproduction costs as more output is produced, for a *given technology*.

Contrary to average costs, reproduction time does not rely on the sunk and fixed costs originally employed in the production of the mold: "the value of the capital advanced … rises or falls as a result of an increase or decrease in the labour-time necessary for its *reproduction*, an increase or decrease that is *independent of the capital already in existence*" (Marx [1894]1994:237-238 − emphasis added). Reproduction time can thus fall to zero after the mold is produced regardless of the large amounts of fixed capital used in its conception.

The immediate drop in the reproduction time of knowledge-commodities after the mold is created does *not* derive from a sudden fall in the average cost due to economies of scale and neither from a change in technology. The extreme case of moral depreciation that characterizes knowledge-commodities derives from the structure of the existing methods of reproduction of commodified knowledge and information. For this reason, moral depreciation is logically consistent only with a theory of value based not on average costs but on reproduction time. We do not have to claim, therefore, that knowledge-commodities have value in order to save Marx's value theory.

Starosta (2012) and Fuchs (2015, chapter 5; 2017) thus disagree with the notion that knowledge production is a type of unproductive activity. Our claim that knowledge creation is an unproductive activity might indicate that the unproductive workers creating knowledge and information are not exploited. But this is definitely not the case:

> [A]ll capitalistically employed labor is exploited by capital, whether it is productive labor or unproductive labor. The rate of exploitation of each is their respective ratio of surplus labor time to necessary labor time. […] In the case of productive workers, their rate of exploitation is also the rate of surplus value, since their surplus labor time results in surplus value (Shaikh and Tonak 1994:31).

In *Capital III* Marx claims that by exploiting unproductive workers the unproductive capitalist grabs a share of the global pool of surplus value:

> It is only by way of its function in the realization of values that commercial capital functions as capital in the reproduction process, and therefore draws, as functioning capital, on the surplus-value that the total capital produces. For the individual merchant, the amount of his profit depends on the amount of capital that he can employ in this process, and he can employ all the more capital in buying and selling, the greater the unpaid labour of his clerks. The very function by virtue of which the commercial capitalist's money is capital is performed in large measure by his employees, on his instructions. Their unpaid labour, even though it does not create surplus-value, does create his ability to appropriate surplus-value, which, as far as this capital is concerned, gives exactly the same result; i.e. it is its source of profit. Otherwise the business of commerce could never be conducted in the capitalist manner, or on a large scale. Just as the unpaid labour of the worker creates surplus-value for productive capital directly, so also does the unpaid labour of the commercial employee create a share in that surplus-value for commercial capital. (Marx [1894]1994:407)

Contrary to Fuchs's approach, and drawing from Teixeira and Rotta (2012), Rigi (2014) builds on the concepts of knowledge-commodities and of knowledge-rents in order to analyze the distribution of surplus value among different forms of intellectual property such as copyrights, trademarks, patents, and trade secrets. Rigi rightfully claims that knowledge-rents cannot be conceptualized solely within national borders, for the core countries are able to extract rents from the surplus value produced in peripheral regions of the globe. In a similar way, Seda-Irizarry and Bhattacharya (2017) conceptualize knowledge-rents at the level of global value chains, as rents might imply the transfer of

surplus from non-capitalist modes of production in peripheral countries to the capitalist mode of production in core countries.

Within the Marxist tradition, an early mention of a category akin to "knowledge-rent" is from Ernest Mandel (1975:192) in his theory of "technological rents" as the surplus profits derived from monopolized innovations that reduce production costs. Haddad (1998) uses the term "knowledge-rents" more precisely to indicate the revenues whose origin lies in the labor of "knowledge workers" employed at private companies. Perelman (2003:305) and Zeller (2008) further establish a comparison between land property rights and patents. But despite their insights, these authors do not develop a consistent value theory of knowledge-rents as we do in Teixeira and Rotta (2012) and Rotta (2018).

Zeller (2008), in particular, offers an attempt at theorizing information rents within a Marxist framework. He posits that intellectual property rights are similar to the enclosure of the commons in the time of primitive accumulation. Even though claiming explicitly that information rents are monopoly rents, Zeller does not explicitly engage into a discussion of whether or not commodified information has value. Despite analogies to land rents and accumulation by dispossession, in his work there is no further theoretical development besides the claim of monopoly rents associated to patents. As we put forth, without a proper value theory of commodified information it is not possible to develop a consistent theory of information rents. Zeller (2008:97) seems to suggest that commodified knowledge does have value and that patents ensure the value of knowledge is realized, but if commodified information has value then the analogy with monopolized land (which does not have value) and land rents is unclear:

> Knowledge is a product of labor. But the problem lies in the fact that information and technology once produced are usually quite simple to reproduce, and therefore the *realization of the exchange value* is questioned […] The phase of producing knowledge and information whose acquisition will be secured based on a patent is normally characterized by a high share of variable capital. Therefore, a potentially high *surplus value* arises here. But it is *not yet realized*. (Zeller 2008:97-99 – emphasis added)

As Teixeira and Rotta (2012:456-459) explain, within a Marxist framework, *interest* is the form of revenue associated with loaned money or with licensed

commodities that have value. *Rent*, on the contrary, is the form of revenue associated with commodities that do not have value. Borrowed money is an amount of value and hence is paid back with *interest*. Borrowed (i.e. leased) machines and equipment have value and hence the lease payments are *interest* payments. In the case of licensed knowledge there is no value being borrowed, and hence the payments associated with it are not interest but *rents* instead. Unworked land yields *rents* to its owner because unworked land requires no labor to be produced (as it is a free gift from nature) and thus contains no value. Without a consistent value theory, as Teixeira and Rotta (2012:456-459) develop, there is a great risk in conflating interest and rent.

The Political Economy notion that knowledge has zero value is featured in mainstream Economics, albeit under a different value theory, as the *zero marginal cost* of knowledge (Duffy 2004). Shavell and van Ypersel (2001:545) note that this special feature of knowledge also applies to industries producing pharmaceuticals, software, movies, recorded music, books, and visual products.

Rotta (2018) is one of the yet few empirical works that attempt to estimate the actual size of knowledge-rents and their evolution over time. Using input-output matrices and national income accounts for the United States from 1947 to 2011, Rotta (2018) arrives at aggregate and disaggregate estimates of Marxist categories for both productive and unproductive activities. The rise of knowledge-rents is just one dimension within the larger secular trend of rising unproductive activity. Unproductive activity has been growing at a fast pace in terms of incomes, fixed assets, and employment. The total income of unproductive activities quadrupled relative to the total value generated in productive activities during the 1947-2011 period. The estimates reveal that knowledge creation and finance have been the fastest growing unproductive activities both in terms of net income and capital stock. As percentage shares of the net income of all unproductive activity within the American economy, there has been substantial growth in the shares of finance and insurance from 14% to 23.2%, and also in knowledge and information rents from 7.9% to 17.4%. Finance and knowledge-rents combined have risen from 21.9% to 40.5% of the net income of all unproductive activity, hence nearly doubling in the postwar period. As percentage shares of the net capital stock in all unproductive activities, the fastest growth rates in shares have been in knowledge and information (from 0.8% to 5.0%) and in finance and insurance (from 1.7% to 10.3%). Finance- and knowledge-related activities have grown their combined capital stocks six fold (or 502%) from 1947 to 2011 as a share of the total unproductive capital stock.

Robbins (2009) provides detailed estimates of corporate income of United States corporations from the use of intellectual property, including royalties and licensing fees. The evidence indicates that these transactions have been growing rapidly at 11% on average per year from 1994 to 2004. Robbins (2009)'s work provides further discussion on how intangible assets and the revenues associated with them impact official GDP estimates. The Bureau of Economic Analysis in the US, for example, now plans to include investment in intangible assets as part of GDP.

The concepts of knowledge-commodities and of knowledge-rents can also unify two important branches of Marxism: the cultural industry (including digital media) and value theory. As Fredric Jameson noticed back in 1984, the Marxist tradition had not yet been able, by then, to integrate "cultural and informational commodities" with the labor theory of value. Our approach, we argue, bridges this gap in the Political Economy scholarship:

> This description is also quite consistent with the Frankfurt School's conception of the "culture industry" and the penetration of commodity fetishism into those realms of the imagination and the psyche which had, since classical German philosophy, always been taken as some last impregnable stronghold against the instrumental logic of capital. What remains problematical about such conceptions – and about mediatory formulations such as that of Guy Debord, for whom "the image is the last stage of commodity reification" – is of course the *difficulty of articulating cultural and informational commodities with the labor theory of value*, the methodological problem of reconciling an analysis in terms of quantity and in particular of *labor time* (or of the sale of labor power in so many units) with the nature of "mental" work and of nonphysical and noncomensurable "commodities" of the type of informational bits or indeed of media or entertainment "products" (Jameson 1984:xi − emphasis added).

In this regard, Fuchs (2013; 2014; 2015; 2016; also Fisher and Fuchs 2015) has done some interesting work on the production of knowledge and information in social media like Facebook, YouTube, Instagram, Myspace, WordPress etc. His argument is that the users themselves are producing the content of the information commodities. Social media companies appropriate and commodify user-generated content without paying for the labor time required to produce it. In return, these companies offer their

services without charge. Fuchs thus labels these users as *prosumers:* consumers that actually produce the content that they themselves consume. Social media companies are responsible for providing the digital platform, thus encoding all the content, and then receiving fees from advertisers.

In spite of our theoretical disagreements in terms of value theory, Fuchs does offer an interesting hypothesis, namely that on social media it is the users (the *prosumers*) themselves that generate the information that is then gathered and commodified by the companies developing the online platforms. Wikipedia, the biggest encyclopedia in the history of humankind, would be another great example of user-generated content, even though in this particular case there is no profit motive and hence knowledge is not commodified. The question that remains open is if, once produced by the users themselves, these information commodities on social media still require labor time to be further reproduced. From our perspective, this user-generated content online necessitates labor to be produced but, once produced, necessitates no further labor to be reproduced. Companies like Google and Facebook can commodify the online content of their users but it is still a commodity with zero value. Our argument does not negate the possibility that the users are somehow 'exploited' when they generate the content online that is later on gathered, processed, and commodified[6]. It does question, however, the notion that this online content on social media has value. Our understanding is that commodified information, because of its effortless reproduction, has always zero value regardless of who produces it.

Implications and final remarks

Notwithstanding the ongoing debate on whether or not commodified knowledge has value, the Marxian Political Economy literature has been able to reach one consensus: that, contrary to the immaterial labor hypothesis, there is still no need to reject the Marxist value theory. The immaterial labor hypothesis has claimed that Marx's value theory is no longer relevant in cognitive capitalism. In this chapter we argued otherwise, namely that

[6] Following Smith's (2013) analysis of "free gifts" to capital, we could claim that when data are produced by people using computers as a by-product of their activity online, the data are provided to capital as a "free gift" outside the commodity form, becoming a commodity only at some later point in some other process. Hence, Fuchs' notion of 'exploitation' of online users does not employ Max's concept of exploitation in its strict sense.

the commodification of knowledge and information can be explained in a consistent way within the Marxist value theory.

This does not mean, of course, that the Marxist theory of value faces no limits. As a theory that is contingent on a specific mode of production and on a specific historical moment, it will make evident its own constrains. One possible case, even still within the capitalist mode of production, is that of artificial intelligence (AI). In Marxist theory, only direct human labor creates new value. Machines and equipment transfer their values to the output but do not add any new value to it. AI could challenge this idea, for it is a non-labor input that does create a new output not previously conceived, foreseen, or planned by human labor. AI implies that fixed capital itself has productive and creative powers, independent of the human labor originally used to program it in the first place.

The Political Economy of knowledge commodification, however, has not yet reached a consensus on the status of knowledge-commodities. The *reproduction cost approach* of Teixeira and Rotta claims that knowledge-commodities tend to have zero value and that the commodification of knowledge leads to the formation of knowledge-rents, drawn from the global pool of surplus value in the economy. The *average cost approach* of Starosta and Fuchs, on the contrary, claims that knowledge-commodities have value and that their value is determined by the initial investment in the research and development of the "mold". Intellectual property rights then assure the realization of the value of commodified knowledge.

Our understanding is that the reproduction cost approach is superior to the average cost approach for two main reasons. First, the reproduction cost approach is much closer to Marx's own insights on value theory. Second, the reproduction cost approach is the only approach consistent with the notion of moral (i.e. value) depreciation; the average cost approach is not. Our empirical estimates also indicate that knowledge-rents have been rising both as a share of the total income of unproductive activities and relative to the total value created in productive activities.

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