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FROM TECHNOLOGICAL UTOPIANISM TO THE THEORY OF UNEQUAL DEVELOPMENT OF AUTOMATION

ABSTRACT

The article counters popular predictions of a coming "post-work society" with the argument that the capitalist development of technology leads to an uneven introduction of automation into production processes, paralleled by the expansion of wage labour in the service sectors of social reproduction and the circulation of capital in the centre of the capitalist world-system, as well as in labour-intensive production in the periphery. We draw our argument from a critical reading of Italian *operaismo* whose development we trace in the terms of the sequence "from official Marxisms to a re-interpretation of *Capital*, from *Capital* to *Grundrisse* and back to *Capital*". The operaists made an epistemological break in the study of the relationship between the forces and relations of production by identifying the capitalist development of technology as a key site of class struggle. They also introduced a theoretically fruitful distinction between the concepts of the technical composition of labour power and the political composition of the working class. By introducing the concept of the social composition of labour power, we aim to draw attention to certain negative tendencies within *operaismo* that led to its vulgarisation by *post-operaismo* authors, while at the same time correcting it in line with contemporary processes of capital accumulation on a world scale.

KEYWORDS

automation, unequal development, *operaismo*, technical composition of labour power, political composition of the working class.

In the second decade of the 21st century, the discourse on automation re-emerged in public opinion,¹ with predictions announcing a new wave of technological inventions that would dramatically increase labour productivity and make a large number of jobs redundant. This new society has been given various names: post-work society, post-scarcity society, etc. (see: Brynjolfsson and

1 The first wave of euphoria that announced the automated society emerged in the 1830s, even before automation was introduced into factories. It then periodically appeared in the 1930s, 1950s, 1980s, and again now from the 2010s on (Benanav 2020: 8).

McAfee 2014, Srnicek and Williams 2015; for an earlier period see Rifkin 1995). According to these projections, we are on the threshold of the fourth industrial revolution, based on the development of artificial intelligence as a new general-purpose technology. This is expected to restore economic growth and create a society of abundance. The key question, then, is what to do with the mass of wage workers who will be left without income. The liberal responses, as well as those on the right and the left, propose the introduction of a universal basic income, which would solve the problem of the predicted wave of unemployment (for a critique of universal basic income, see: Benanav 2020: 72-79). The public release of ChatGPT, a chatbot with artificial intelligence, at the end of 2022, triggered a new wave of euphoria, but also caused fear, particularly among the so-called creative class who feared losing their jobs.

We will approach the problem of technology and the automation of work through the concepts of historical materialism. First, we will present the Italian *operaismo* (workerism) movement, which created a theory that criticised the notion of the class and the ideological neutrality of technology and interpreted its development as the result of the class struggle of capital against the working class. Later, the so-called *postoperaismo* vulgarised this theory and joined popular utopianisms that still dominate.² To avoid such an impasse, we will resort to Marx's theory of the uneven development of automation and the tendency of the rate of profit to fall. Using an analysis of the contemporary composition of labour power in the United States, we will seek to simultaneously critique and strengthen the theoretical apparatus of *operaismo* by adding the concept of the social composition of labour power. Upon this background, we will show how the current development of automation in the process of capital accumulation on a world scale reshapes the contemporary social composition of labour power by multiplying both the technical compositions of labour power and the legal statuses of workers.

***Operaismo*: from reformism back to Capital**

Operaismo was an Italian Marxist movement, developed by the journal *Quaderni rossi*, which, in its theoretical and political work, emphasized the capitalist use of machines and the class struggle that capital wages against the working class through the development of technology (for the history of the operaist movement, see: Turchetto 2008, Trotta and Milana 2008, Wright 2017).

Raniero Panzieri, the founder of operaist theory, developed a critique of the technicism of the early 1960s, protesting against the post-war reformist policy

² Utopian thought can certainly be productive in exploring the potential of technology to transform social relations. However, it should be subjected to theoretical analysis that reveals whether a particular utopian imagination is grounded in the assumptions of dominant ideologies or in their critique and transcendence. For an understanding of utopia as a means of estranging the present and uncovering the contradictions and limits of existing social relations, see: Jameson 2005.

of left parties and trade unions. After WWII, organised left politics agreed to the “productivist compromise” that tied wage growth to labour productivity growth, believing that progress in technology will “rationalise” production processes and, by the introduction of Taylorism-Fordism into the Italian economy during the 1950s, will bring general well-being to Italian society. According to Italian communists, the participation of the working class in post-war economic reconstruction would gradually lead to socialism by accentuating the antagonism between the increased development of the productive forces, which would gradually socialise the working class, and the capitalist relations of production, which would ultimately become redundant in relation to socialised production processes. Panzieri claimed that this traditional Marxist position shared by the Second and Third Internationals, as well as by Soviet Marxism of the time, resided in a technicist ideology, which he called “objectivism” (Panzieri 1980 [1961]). This ideology presents the development of technology as the rational core of the capitalist mode of production that will gradually break the restrictive envelope of capitalist production relations of the private appropriation of surplus value and lead inexorably to socialism. “Objectivism” thus considers that capitalist production processes are based on the purely technological development of the means of production, from which arises the rational planning of the technical division of labour, so that the rationalisation of production can be supposedly separated from the social relations of capitalist exploitation and market anarchy.³

Analysing Marx’s Part Four of the first volume of *Capital* (Marx 1976 [1867]) and the posthumously published fragment “Results of the Immediate Production Process” (Marx 1976 [1863–4]), Panzieri argued that the development of the capitalist division of labour, from simple cooperation to manufacture and to large-scale industry that introduces automated machinery into the production process, is in reality a development toward the ever-increasing real subsumption of labour under capital. Commenting on the transition from manufacture to large-scale industry, Panzieri concludes that the use of machinery in the production process is capital’s response to the insubordination of skilled craftsmen, whose skills and knowledge were still indispensable in the production process. By developing the means of production, capital reacts to the class struggle of the workers, trying to deskill, fragment and mechanise their work by transferring workers’ intellectual capacities and skills to an automated system of machines. Dead labour, embodied in automated means of production in the form of constant capital, now confronts living labour as a superior force with its own productive and organising power. In this way, the subordination of labour to the technology of the capitalist production process ideologically transforms the despotism of capital over labour into the subordination of

3 “This ‘productivist’ conception, which construes capitalism as private property plus the market, counter-posing to it socialism understood as public property and planning, implies that the capitalist organisation of production is accepted in the main” (Turchetto 2008: 286).

labour to the rational application of science and technology. The historically contingent form of social domination thus appears as a purely technical necessity, so that the integration of labour into the accumulation of capital takes on the converted ideological form of the complementarity of living labour to the objective progress of science.⁴

According to Panzieri, technical progress and science are therefore not something neutral and external to the class struggle, but rather represent a key weapon in the struggle of the capitalist class against the working class. In its struggle against the working class, capital is forced to constantly recompose through technology the production process and the division of labour: “The technology incorporated in the capitalist system at once destroys the old system of division of labour and consolidates it systematically, ‘in a more hideous form’, as a means of exploiting labour-power” (Panzieri 1980 [1961]: 46). The subordination of labour to technology does not lead to the emancipation of labour from capital, but to the increasing domination of labour by capital. Criticising the simplified opposition of productive forces to relations of production, Panzieri states: “The relations of production are within productive forces, and these have been ‘moulded’ by capital” (Panzieri 1976 [1964]: 12; translation modified). The development of productive forces, therefore, does not automatically result in the necessary overthrow of outdated production relations. The surrender of the working class to the technocratic ideology of progress does not lead to the “socialist use of machines”. To the contrary, emancipation requires workers’ political action, which breaks with the economicist capitalist rationality of the production process and introduces workers’ organization and control over the production process. Trade-unionist economic struggle for higher wages and better working conditions must therefore be overdetermined by a political struggle that rejects the rationality of capitalist production and thus the domination of capital over the working class.

In the texts of the early 1960s, Panzieri introduced all the important themes later developed by the theoreticians of *operaismo*. Mario Tronti radicalised Panzieri’s restoration of Marx’s then forgotten distinction between labour power and the working class (Tronti 2019 [1971]). According to Tronti, labour power represents the form of integration of labour into the capitalist production process, where labour exists as variable capital, as an integral part of the accumulation of capital. The working class emerges only through the political organization of workers, the refusal of work, and the assertion of its autonomy

4 “The capitalist objectivity of the productive mechanism with respect to the workers finds its optimal basis in the technical principle of the machine: the technically given speed, the coordination of the various phases and the uninterrupted flow of production are imposed on the will of the workers as a ‘scientific’ necessity, and they correspond perfectly to the capitalist’s determination to suck out the maximum amount of labour-power. The capitalistic social relationship is concealed within the technical demands of machinery and the division of labour seems to be totally independent of the capitalist’s will. Rather, it seems to be the simple and necessary results of the means of labour’s ‘nature’” (Panzieri 1976 [1964]: 9).

from capital, that is, through the union of workers in political action aimed at subverting the existing capitalist division of labour. The working class therefore constitutes itself only by the political gesture that affirms the autonomy of labour in relation to capital, by refusing the existence of labour as variable capital. Through political organisation, the carriers of labour power thus transform themselves into the working class. According to Tronti, capital responds to working class resistance by introducing new technologies and appropriate divisions of labour that aim to break the political organisation of the working class. From here, Tronti introduces the hypothesis of the primacy of the class struggle of the working class in the development of capitalism. In this conception, the working class loses its passive role, that of labour power that changes with the development of capitalism, and acquires an active role, while capital assumes a reactive role and transforms itself in response to the political class organisation of the working class. The class struggle of the working class is the engine of the development of capitalism. Accordingly, theoretical analysis must focus on the “laws of the development of the working class” (ibid.: 65).

From the distinction between labour power as an integral element of capital and the working class as a political agent, Sergio Bologna further developed the distinction between the technical composition of labour power and the political composition of the working class (Bologna 1976 [1972]). Bologna explains these concepts using the example of highly specialised “professional workers” in the German machine industry in the first decades of the twentieth century, who became leaders of the workers’ council movement in the November Revolution of 1918. As these workers were highly qualified, their possession of professional skills afforded them a high degree of autonomy vis-à-vis capital. The ability to control the production process, which these workers still had, allowed them the capacity to slow down and interrupt production. According to Bologna, the privileged position of these workers in the technical composition of labour power enabled them to lead the organisation of the political composition of the working class in the form of the workers’ councils movement. In the introduction of the Fordist assembly line after the First World War, Bologna sees a strategy of capital to de-skill professional workers, fragmenting the production process and reducing the necessary skills of workers to a series of simple repetitive operations. By subordinating workers to Fordist automated machinery, capital created a new type of easily replaceable, de-skilled “mass worker”, recruited from the ranks of mobile migratory labour power. With the new technical composition of labour power, dictated by new technologies, capital decomposes the existing political composition of the working class and, by imposing the new division of labour, subordinates workers to the demands of capital accumulation. The technical division of labour is thus capital’s strategy to dissolve the workers’ class composition and to reduce workers to labour power, depriving them of the leverage they had in the class struggle against capital.

However, every decomposition of the working class leads to its re-composition, which starts a new cycle of class struggle. The working class is thus not

a static category, but a dynamic one that changes, reconfigures, and produces itself anew through the class struggle. The new technical composition of labour power provided an opportunity for workers to develop new organisational skills in their struggle against capital. The large concentration of workers in huge Fordist factories and the levelling of work qualifications of the easily replaceable, de-skilled mass workers made it possible for them to massively organise on the basis of greater solidarity and egalitarian demands without the obstacles previously set by the hierarchies of professional competences. The continuous flow of production on the assembly line opened up the possibility for workers to block the entire production process at its various points. During the 1960s, operaists thus witnessed the rise of a new political composition of the working class based on the hegemonic group of mass workers and their potential to organise a large number of protests and strikes throughout Italy, whose methods and demands broke the boundaries of unionism.

However, already during the 1970s, capital reacted, introducing a new technical composition of labour power that the so-called post-operaists would later term “post-Fordism”. Antonio Negri, the theoretician in whose work the most pronounced slippage from operaism to post-operaism occurs, developed the hypothesis that the new technical composition of labour power produced a new hegemonic group of workers – the “social worker”, whose emergence, in his view, signaled the phase of exit from capitalism.

Postoperaismo: From Capital back to Grundrisse

Negri’s concept of the “social worker” has its roots in Tronti’s concept of the “social factory”, which itself arose from Panzieri’s view that in the monopoly phase of capitalism, planned organization expands from the sphere of production, to circulation and to other social spheres (see: Palazzo 2014). However, while Panzieri had seen these processes of increasing social control by capital as a consequence of the process of capital concentration, Tronti founded his concept of the social factory on the expansion of wage labour into the sphere of social reproduction and on the expansion of the service sector, through which the proletarian base of society broadened. During the 1970s, Negri tried to establish his hypothesis about the rise of the “social worker” upon a reinterpretation of the concept of the social factory through Marx’s hypothesis about the emergence of the *general intellect* as the signal of the terminal phase of capitalism.

Negri based his analysis on Marx’s posthumously published manuscript *Grundrisse* (Marx 1993 [1857–8]). These notes are Marx’s first attempt to elaborate the theory that finds its full expression in *Capital*. Negri, however, favoured *Grundrisse* over *Capital*, and the famous excerpt from this manuscript, “Fragment on Machines” became the Bible of post-operaism (for the reception of the “Fragment on Machines” in operaist theory, see: Tomba and Bellofiore 2014).

In the “Fragment on Machines” Marx argued that the tendency of capital to, in an effort to increase labour productivity, minimise the participation of living

labour in the production process and replace it with machines, will lead to the development of science and technology increasingly becoming the source of material wealth, by which “production based on exchange value breaks down” (Marx 1993 [1857–8]: 705). Instead of accumulating the surplus value of living labour, capital thus begins to be based more and more on the absorption of the “accumulation of knowledge and of skill, of the general productive forces of the social brain” (ibid.: 694). The capital increasingly “depends [...] on the general state of science and on the progress of technology, or the application of this science to production” (ibid. 705).

According to Marx in the *Grundrisse*, the automation of production carries the germ of capitalism’s self-destruction: in search of greater profits, capital increasingly expels direct labour from the production process, thus undermining the law of value on which capital accumulation itself functions, and at the same time emancipating workers from the process of direct production.

As a consequence, “the general reduction of the necessary labour of society to a minimum” makes possible “the artistic, scientific etc. development of the individuals in the time set free, and with the means created, for all of them” (ibid.:706). Again, this trend accelerates the development of science and technology, which itself accelerates the accumulation of constant capital.⁵ Marx concludes:

“[...] In this transformation, it is neither the direct human labour he himself performs, nor the time during which he works, but rather the appropriation of his own general productive power, his understanding of nature and his mastery over it by virtue of his presence as a social body – it is, in a word, the development of the social individual which appears as the great foundation-stone of production and of wealth (ibid.: 705). [...] 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 (ibid. 706).”

For the Marx of *Grundrisse*, human labour emancipates itself from the direct production labour, which is directly subsumed under capital, and becomes the collective labour of the “general intellect”, the “social individual” who, by developing science, becomes the main social productive force that directly increases constant capital. This intellectual labour, freed from capital and the yoke of exchange value, thus no longer needs the mediation of capital in order

5 In *Grundrisse*, Marx still uses the expression “fixed capital” for the capital invested into the means of production. He establishes the conceptual distinction between constant capital (invested into the means of production) and variable capital (invested in the labour power) only in *Capital, Volume I*. The logic of the presumed self-destruction of capital in *Grundrisse* emerges from the increase of the capital embodied in the means of production, and the decrease of the capital invested in the labour power (from what Marx will later in *Capital* conceptualise as the increase of the organic composition of capital). In our interpretation, we use the conceptual distinction “constant/variable capital”.

to develop productive forces, but becomes the “immediate productive force” itself, labour that is directly productive. The development of the productive forces of the general intellect thus breaks through the restrictive frameworks of capitalist production relations, which become a brake on its free development.

Negri articulated Marx’s scheme of the self-abolition of capital from the *Grundrisse* with Tronti’s theory of the cycles of class struggle. He returned to the teleological problematic of the inevitability of the emergence of socialism, where the dialectic of productive forces and productive relations has been replaced by class struggle. Negri restored the ideological problematic by whose critique *operaismo* had produced its epistemological break (for the evolution of Negri’s thought, see: Wright 2017: 140-162).

According to Negri, every destruction of the political composition of the working class by capital results in an expanded technical composition of labour power, which provides the basis for a new expanded political composition of the working class. The partial subsumption of labour in manufactures thus provided the basis for the emergence of professional workers who, as the hegemonic group in the labour movement, organised workers into the working class. The introduction of automated machinery in Fordist factories produced a levelling of deskilled labour, which made it possible for the increased mass of workers in the entire large-scale industrial production to organise themselves politically into the working class.

During the 1970s, operaists witnessed the attempts of capital to break the new political composition of the working class based on the mass worker. Negri very early noticed phenomena whose tendencies would only later become dominant. He interpreted the growth of the service sector, together with the precarisation of workers in it, as the expansion of capital control from the sphere of production to the sphere of circulation and social reproduction. Negri analysed the decentralization of industrial production through subcontracting and outsourcing of the labour-intensive parts of the production process, both domestically and internationally, as capital’s strategy to break up large concentrations of workers in large Fordist enterprises. He noticed how capital segmented the labour market by legal methods, in order to isolate mass workers in the factory under the unions’ corporatist control, from which the working class had escaped during the sixties, and to separate them from the marginalised service workers (Negri 1988 [1982]).

Operaists recorded the collapse of the mass workers’ resistance. Negri, for his part, interpreted this defeat as a pyrrhic victory of capital that prepared the ground for the imminent advent of socialism. He assumed that capital’s response to the political composition of the working class based on the mass worker necessarily laid the foundation for the technical composition of labour power that reached beyond the walls of the factory and extended wage labour to the entire society. Negri claimed that capital thus produced a technical composition of “social labour power” which introduced “the potentiality of a new working class, now extended throughout the entire span of production and reproduction – a conception more adequate to the wider and more

searching dimensions of capitalist control over society and social labour as a whole" (ibid.: 207).

The real subsumption of labour under capital thus spreads from labour within the production process to the entire society. At the same time, the old political composition of the working class represents an obstacle to the creation of a new political composition: just as the professional worker was an obstacle to the organisation of the mass worker, so the mass worker became an obstacle to the emergence of a political composition based on Negri's "social worker". However, Negri's notion of the "social worker" who is presumably the new hegemonic agent destined to organise workers into the new historical figure of the working class, does not derive from an analysis of the complexity of the new technical composition of labour power. It is only an assumption originating in the teleology of Negri's notional model.

To confirm his assumption, Negri specifically referred to *Grundrisse*, arguing that in this work Marx offers an anticipation of the new society that emerged in the 1970s, where the law of value ceased to operate (Negri 1991 [1978]). The struggle of the working class during the 1960s and 1970s went beyond the productivist compromise and, declaring the slogan *più soldi, meno lavoro* (more money, less work), demanded an increase in wages without correlation to an increase in labour productivity. According to Negri, this meant that capital lost the ability to measure exploitation, and consequently the state assumed the role of determining the distribution of income into profits and wages. Economic mechanisms have thus lost their autonomy: the method of exploitation has been transformed from the mechanism of the "law of surplus value" into a direct political command, which denaturalizes exploitation and makes it appear as an arbitrary political decision. Negri interpreted the emergence of student movements, feminist groups that demanded wages for domestic work, struggles to reduce the prices of public services, squatting, non-payment of entry to cultural manifestations, movements of the unemployed, organised looting, subcultural protests, etc., as the spread of the class struggle to the sector of reproduction of labour power. For Negri, these were the demands of the new proletariat that rejected the wage relationship and requested self-valorisation – the direct satisfaction of their needs without participation in the valorisation of capital. These aspirations found their expression in the demand for a guaranteed wage for all of the labour power.

Negri assumed that the struggles, which reached beyond the boundaries of the factory and spread into the domain of the reproduction of labour power, indicated a tendency towards the emergence of a new composition of the working class based on the hegemony of the social worker. He hypothesised that the tendency must somehow arise from the emerging technical division of the social labour power.

Referring to the "Fragment on Machines", Negri argued that industrial work and the mass worker, together with the law of value, were a remnant of the past. He claimed that the new social work, based on the intellect, imagination and creativity of the social worker, is directly productive and does not

need capital for its valorisation. Capitalism has lost its economic function and now survives only as political-legal coercion that parasitizes the development of the creative-intellectual capacities of the social worker.⁶

Negri has not explained who the new social workers actually are and how they are supposed to lead other fractions of labour power towards a new composition of the working class (for an early critique of Negri's notion of "social worker", see: Bologna 2006 [1976]). It seems that Negri tried to deny the deep division of the working class produced by capital, and reduced it to the Procrustean bed of his philosophical apparatus "that is self-reproducing, and where reference to the concrete has no other function than to validate a purpose-built philosophy of history" (Bellofiore and Tomba 2017: 243). The development of post-operaism thus boiled down to a messianic search for a new assumed subject of history, to declaring workers in one or the other economic sector to be the hegemonic figure of the working class, tending to embody themselves as the general intellect. The presumed figure of the social worker thus received various incarnations over time: the immaterial worker, cognitariat, multitude, biopolitical worker, affective worker, cyborg, etc. The development of communication and information technology and personal computers during the 1980s, as well as the spread of the Internet during the 1990s, prompted post-operaists to formulate hypotheses about the post-industrial

6 The theme of the demise of the law of value, arising from the crisis of the measurability of labour, was taken up in Hardt and Negri's *Empire* (2000), a work largely responsible for the global popularity of *post-operaismo* in academia and the art world. This hypothesis has been the subject of sustained criticism from Marxists (see: Thoburn 2001; Camfield 2007; Caffentzis 2011; Rigi 2015; Pitts 2018). Namely, according to Hardt and Negri, in "postmodern capitalism" labour extends beyond factory walls, the division between work and free time collapses, and both labour and its products become increasingly immaterial. Consequently, capital is no longer able to quantify labour and determine its value. At the same time, immaterial labour, permeated by readily accessible information and communication technologies, is seen as capable of organising itself beyond capital's control. From this they concluded that the valorisation of labour by capital becomes arbitrary and that the law of value ceases to function, while labour is now able to generate value directly without the mediation of capital. Critics have argued that, rather than differentiating between the social forms of labour and their articulation within the processes of capital accumulation, Hardt and Negri instead drew distinctions on the basis of the technical properties of labour's products. They then conflated Marx's concepts of concrete and abstract labour, and thereby also the concepts of wealth and value. According to Marx, concrete labour does not produce value in and of itself; rather, only abstract labour does, and its value is not determined by the duration of the concrete labour process but by the socially necessary labour time established through the exchange of commodities on the market. Moreover, for Marx, value represents a social form of labour specific to the capitalist social relations, which makes the claim that value can be produced outside the mediation of capital nonsensical from the standpoint of Marx's value theory. The development of information and communication technologies has demonstrated that the conditions of production are increasingly concentrated in monopolistic high-tech corporations, and that capital has developed new techniques of control and surveillance over labour processes, rendering claims about the organisational autonomy of labour from capital unsustainable.

age and the rise of the creative class, in whose ranks they looked for the vanguard of the social worker class. The serious theoretical production that began with Panzieri thus ended up in the literary genre of technological utopia (Turchetto 2008: 296-297).

Uneven Development of Automation: From *Grundrisse* Back to *Capital*

In *Grundrisse*, Marx had not yet thoroughly developed his key concepts of value, the production of relative surplus value, nor his theory of crisis. As Michael Heinrich notes, the problem with Marx's theory of crisis in the "Fragment on Machines" is that it interprets the replacement of workers by machines as a continuous process, leading linearly to the collapse of the law of value (Heinrich, 2013). However, in *Capital*, Marx constructed a more rigorous theory of the production of relative surplus value, on which he based his new crisis theory. The value of a commodity is grounded in the average social productivity of labour necessary for the production of a commodity within a given economic sector. By introducing labour-saving technologies into the production process, individual capitalists aim to reduce their variable capital costs (wages) and thereby gain extra surplus value relative to their competitors by reducing the necessary labour time below the social average. To remain competitive, other capitalists in the same sector are compelled to adopt new technologies as well. This competition to acquire extra surplus value through the introduction of machinery that increases productivity leads to a reduction in commodity values. However, if labour productivity increases in sectors producing means of subsistence that contribute to the value of labour power, the value of labour power will decrease, shortening the necessary labour time for its reproduction. As a result, the surplus value appropriated by capitalists may rise even though the value of commodities falls (Marx 1976 [1867]: 429-438).

Capitalists are not interested in increasing productivity per se; they are interested in boosting their profits. They will only introduce new means of production if their introduction costs less than wage costs. Consequently, productivity increases under capitalism are neither continuous nor linearly progressive. Similarly, the use of machinery in capitalist production does not automatically lead to shorter working days or mass unemployment but instead results in intensified labour and higher exploitation rates. Marx interprets this contradiction through the uneven distribution of technology across various economic sectors. For instance, introducing advanced technology in one sector may reduce labour demand in that sector, but the surplus labour power might migrate to other sectors whose growth is spurred by increased demand for the now cheaper commodities of the former. However, since the market now contains an excess labour supply forced to accept wages below the value of labour power, sectors absorbing this labour may not feel encouraged to introduce new technologies. Instead, they can extract greater surplus

value by using labour-intensive production processes.⁷ This uneven development of automation means that the automation of one economic sector creates the conditions for the survival of technologically stagnant sectors elsewhere.⁸ In stagnant sectors, surplus value is increased not through productivity gains (relative surplus value) but by extending working hours and intensifying work to produce absolute surplus value.

Marx also noted, in his observations of mid-19th-century England, that a significant portion of cheap labour not absorbed by the economy became a “servant class,” working in the households of the capitalist and middle classes.⁹ Automation-driven productivity increases thus not only foster the emergence of stagnant sectors with heightened exploitation rates via absolute surplus value, but also expand the unproductive service sector, a domain of luxury consumption where no new value is produced.

Based on his theory of relative surplus value, Marx in the third volume of *Capital* developed the theory of the tendency of the rate of profit to fall. As noted earlier, in the pursuit of relative surplus value, individual capitals tend to reduce the share of living labour relative to the means of production. When this reduction occurs in value terms as well, Marx conceptualised it as an increase in the organic composition of capital. Since living labour – the expenditure of labour power in the production process – is the sole source of new value, an increase in the organic composition of capital leads to a tendency for the general rate of profit to fall. However, unlike in *Grundrisse*, Marx now saw the crisis caused by this falling profit rate only as a tendency counteracted by other opposing tendencies that halt the decline in profitability. The most significant of these counter-tendencies is increasing the rate of exploitation through intensified work and the production of absolute surplus value (Marx 1981 [1894]: 317-375).

7 “In the older countries, machinery itself, when employed in some branches of industry, creates such a superfluity of labour (‘redundancy of labour’ is how Ricardo puts it) in other branches that the fall of wages below the value of labour-power impedes the use of machinery in those other branches and, from the standpoint of the capitalist, makes the use of machinery superfluous, and often impossible, because his profit comes from a reduction in the labour paid for, not in the labour employed” (ibid.: 516).

8 “Capital’s higher technical composition in some parts of the world does not automatically give rise to a corresponding tendency. Rather, much as the development of the textile-industry in England lead to the extension of slavery in the Americas, capitalist development may produce, at one and the same time, a massive expulsion of labour-power within the Western metropolises (by which this labour-power is rendered precarious and underpaid) and a transfer of surplus-value to productive areas characterised by low wages, a low technical composition of capital and absolute exploitation” (Tomba and Bellofiore 2014: 356).

9 “Lastly, the extraordinary increase in the productivity of large-scale industry, accompanied as it is by both a more intensive and a more extensive exploitation of labour-power in all other spheres of production, permits a larger and larger part of the working class to be employed unproductively. Hence it is possible to reproduce the ancient domestic slaves, on a constantly extending scale, under the name of a servant class, including menservants, womenservants, lackeys, etc.” (Marx 1976 [1867]:574).

The increasing automation in certain economic sectors – those with a high organic composition of capital – thus simultaneously requires an increase in the production of surplus value in labour-intensive sectors, those with a low organic composition of capital. According to Marx, the competition among capitalists in increasing relative surplus value results in the formation of an average rate of profit and thereby in the transfer of surplus value from sectors with a low organic composition of capital to those with a high organic composition of capital (ibid.: 239-313). The decline in the production of surplus value in the most technologically advanced sectors of production is thus compensated by an increase in the production of surplus value in technologically stagnant production processes that require a greater input of living labour. So the profits of technologically advanced sectors contain not only the surplus value produced within those sectors, but also a significant portion of the surplus value produced in labour-intensive branches. In this way, the growing number of workers in technologically stagnant sectors of production, together with the rising rate of their exploitation through the increase of absolute surplus value, functions as a counter-tendency to the falling rate of profit (cf. Caffentzis 2013).

According to the mature Marx in *Capital*, the automation of a given economic sector leads, on the one hand, to an increase in unproductive workers in the personal services sector, and on the other, to a growth in the number of productive workers employed in labour-intensive sectors. Automation thus results in the expansion of “the servant class” and of low-skilled productive workers, rather than in the emergence of “a post-work society”.

From the technical composition of labour power to the social composition of labour power

Marx’s analysis of automation and crisis in *Capital* is far more complex than in *Grundrisse*. Drawing on Marx’s analysis in *Capital*, Jason E. Smith has attempted to sketch what operaists called the technical composition of labour power in the contemporary United States (Smith 2020). According to Smith, the major wave of automation in the US large-scale industry during the 1950s and 1960s did not result in mass unemployment. Instead, the burgeoning service sector absorbed not only displaced industrial workers but also women who were entered the labour market in increasing numbers during this period (ibid.: 29). Thus, the majority of the labour power in the core economies became trapped in a technologically stagnant capitalist service sector, which had largely commodified the sphere of labour-power reproduction. This sector has been characterised by precariousness, intensified exploitation, and stagnating real wages. Smith notes that as many as 94% of new jobs created in the US since 2000 have been in categories such as education, healthcare, social assistance, bars, restaurants, and retail (Smith 2024: 94). The specific nature of these roles – requiring personal interaction and affective responses – and the availability of cheap labour prevent significant automation in these occupations. Moreover, their decentralised organisational structures impede effective collective

resistance. Smith concludes that the contemporary US economy increasingly resembles 19th-century England, except that today, domestic servants have been replaced by precariously employed service-sector wage workers.

According to Smith, the statistical category of the service economy conceals an increasing share of unproductive labour within the US economy – labour that produces no new value and is instead compensated from the surplus value generated by productive labour. Unproductive labour includes work in circulation (employed by financial or commercial capital) and jobs serving the personal luxury needs of capitalists (see: Mohun 2002).¹⁰ Smith argues that the expansion of unproductive labour explains the so-called “productivity paradox” posed by economist Robert Solow in 1987, who asked why advances in information and communication technologies had not significantly increased productivity in the US economy.¹¹ Smith contends that these technologies are primarily deployed within circulation capital to extract monopoly rents rather than to produce new value.

This rentier function of new technologies became prominent in the mid-2000s with the rise of US big-tech companies known by the acronym GAFAM (Google, Apple, Facebook, Amazon, and Microsoft). These companies derive most of their income from monopolies in capital circulation: advertising-funded digital platforms monopolise advertising spaces, offering free services to users (e.g., search engines, social networking platforms, content, or software), to extract rents from companies advertising their products; similarly, Amazon’s monopoly in online retail derives its income from producers’ profits (Bilić, Prug and Žitko 2021).

The pumping of stock prices for these companies revived financial markets after the 2008 housing bubble burst. Most of their profits are allocated to share buybacks, further inflating their stock values without correlating to real profit growth. Since the 1980s, as financialisation took hold in the US, substantial profits have been diverted from investment in productive capital to financial speculation and rentier activities, inflating speculative bubbles for companies maximising profit at the expense of the productive sector and fostering unproductive jobs in banking, financial transactions, insurance, legal services, etc. (Smith 2020: 48–53).

Smith’s analysis of American labour power can be contextualised within the world-system framework. The falling profit rates in the core capitalist economies, triggered by automation in industrial sectors during the 1960s and 1970s, were mitigated by outsourcing labour-intensive production processes (e.g., sewing and electronics assembly) to peripheral countries, where the

¹⁰ Although unproductive labour employed in the circulation of capital does not produce new value, it contributes to the maximisation of the rate of profit (Duménil and Lévy 2011).

¹¹ “[...] what everyone feels to have been a technological revolution, a drastic change in our productive lives, has been accompanied everywhere, including Japan, by a slowing-down of productivity growth, not by a step up. You can see the computer age everywhere but in the productivity statistics” (Solow 1987: 36).

super-exploitation of labour was possible (for the concept of super-exploitation see: Smith 2016), and by subcontracting services to low-paid, unskilled local and migratory workers.¹² The surplus value produced in the periphery was transferred to capital in the core, counteracting the falling profit rates. As a result, central capital, with access to cheap peripheral labour, lacked incentives to increase productivity significantly in its industrial sectors and instead shifted investments from production to circulation capital, financial speculation, and rentier information technologies – spheres that do not create new value but instead extract surplus value from productive sectors, now largely located in the periphery. This restructuring of the international division of labour has redirected automation in the core economies primarily towards the service sector to reduce circulation capital costs and maximise rents.

The uneven development of automation following the profitability crisis of capital in the 1970s did not lead to a homogenisation of the technical composition of labour power that would have produced the figure of a unified ‘social’ or ‘immaterial’ worker envisaged by *post-operaismo*. On the contrary, it led to the multiplication of technical compositions of labour power through subcontracting and outsourcing, combined with the proliferation of new legal forms of labour through the expansion of non-standard employment relations, resulting in a greater fragmentation of labour power.¹³ This articulation of different technical compositions of labour power and the legal statuses of workers within the process of capital accumulation on a world scale we may call the social composition of labour power (for the introduction and initial elaboration of the concept of the social composition of labour power, see Močnik 2011). During the class compromise under the domination of capital in the center of the system after the Second World War, the tendency was toward a *homogenisation* of the social composition of labour power through the standardisation of its technical composition in the ‘Fordist’ regime of capital accumulation, and toward the generalisation of the legal form of that regime — the standard open-ended employment contract under labour (as opposed to civil) law. The response of the working class was political class composition

12 See Hassel (2014) for a study of the recomposition of German labour power, in which high-skilled manufacturing workers’ unions from the export sectors managed to secure their labour rights while at the same time pressuring for the outsourcing and precarisation of service labour in order to reduce companies’ costs and increase their own real income. At the same time, German manufacturing companies began to increase the outsourcing of labour-intensive parts of their production processes to Eastern European countries.

13 The same technical composition of labour power, given the proliferation of non-standard forms of employment, does not automatically lead to workers’ solidarity, even within individual companies, but rather to intensified competition among them. This competition among employees with the same technical skills now takes the form of “climbing up the legal ladder: from student work in the company, through agency work and fixed-term employment to an open-ended contract” (Breznik 2024: 632). A full-time employment contract with union representation is no longer the norm, but instead a goal attainable only by a minority of workers, who thereby constitute a kind of labour aristocracy.

within trade unions and party organisations, through which, over the course of several decades (though still within capitalist limits), the welfare state was created in the center of the capitalist world-system. The ruling classes, under the dual pressure of workers' struggles and the onset of the declining phase of the systemic cycle of accumulation, retreated from the class compromise and began to introduce new forms of production and appropriation of surplus value — first referred to as 'post-Fordism', and now known as neoliberalism. The main effect of capital's anti-crisis strategies was the dismantling of the existing political composition of the working class through the imposition of a new, *heterogeneous* social composition of labour power, ranging from the 'aristocratic' digital nomadism to the 'enslaved' unfree wage labour (for the concept of unfree wage labour, see Brass 2022, Breznik, 2023).

The current uneven development of technologies (ranging from high-tech breakthrough start-ups in the center and in China to manufacturing in the sweatshops of the Third World) is the technical aspect of capital's combined strategies in the search for extra profits and monopoly rents. The capitalist rationality that governs these strategies is a form of class struggle of the ruling classes at the level of the entire social formation, that is, of the capitalist world-system. Contemporary strategies of capital multiply the technical composition of labour power and the legal forms of labour, resulting in the fragmentation of the social composition of labour power. If we wish to analyse the effects of introducing new technologies such as automation and artificial intelligence, it is necessary to examine how they affect the technical compositions of labour power, and then how their overall impact rearticulates the social composition of labour power.

Conclusion

The "social worker" heralded by Negri as the new working-class that will lead the struggle to overcome capitalism has, within this restructured social composition of labour power, been split into two groups. One group is the "creative class," a new labour aristocracy, tending to the needs of circulation capital, concentrating especially around information and communication technologies. The other group are low-paid, fragmented service workers, primarily in the reproduction sphere. The third group – super-exploited peripheral industrial workers in labour-intensive production at the lower tiers of global value chains – are not remnants of an obsolete technical composition obstructing the rise of "immaterial labour". They are the product of a new social composition of labour power, generating surplus value and counteracting the expansion of unproductive labour in the system's centre.

With the concept of the social composition of labour power, we aim to highlight the theoretical error of *operaismo* and *post-operaismo*, which interpret different technical compositions of labour power only in temporal succession and as mutually opposed, without considering their articulation within the process of capital accumulation. From this premise followed the mistaken

conclusion that workers in the most technologically advanced sectors of production were destined to become the leaders of a new political composition of the working class, thereby slipping into technological determinism. Without the articulation of political struggle with other fractions of labour power, workers in the most advanced sectors are more likely to become a privileged labour aristocracy than the vanguard of the working class (for the integration of free software communities into the circuits of capital accumulation, see: Prug and Žitko 2023).

The contemporary wave of automation, driven by the development of AI technologies based on machine learning, is already fragmenting the creative class and deskilling parts of labour processes. As James Steinhoff's studies show, the fragmentation of labour power is underway even within the AI sector itself (Steinhoff 2021, 2022, 2023). At the upper rungs of the ladder are very well-paid data scientists and data engineers, highly skilled in mathematics, physics, and programming. At the middle level are less-educated data analysts, who rely on pre-existing software and tools and are at risk of being displaced by automation. At the bottom are subcontracted, low-paid service workers (cooks, janitors, security staff, etc.) alongside the so-called 'ghost workers,' largely based in the Third World, who perform repetitive data labelling and the identification of explicit images and hate speech. Hired through platforms such as Amazon's Mechanical Turk, they carry out digital piecework for micropayments.¹⁴

By partially automating the production of algorithms, artificial intelligence will probably take over part of the tasks of computer programmers and designers, which will eventually reduce the number of this privileged layer of creative workers, and make it more difficult to enter its ranks. The advent of automation in the service sector through AI technologies will neither trigger mass unemployment nor create a work-free society, nor a socialism of immaterial labour freed from the control of capital. Most likely, it will deepen the existing division within the working class. The most skilled part of the creative class – the labour aristocracy – will retain their positions, as automation cannot yet replicate their complex skills although their numbers will nevertheless be reduced. Those in mid-level roles performing more routine tasks are likely to be displaced by automation, while the lower strata – the majority – will be subjected to intensified exploitation (cf. Smith 2020: 22). Rather than realising futuristic visions, capitalist automation will yield archaic outcomes, with most workers continuing their transformation into a "servant class."

14 The technological capacity of machine learning to 'automate automation' through the algorithmic production of algorithms leads Steinhoff to observe, contrary to *post-operaismo*, an increasing autonomy of capital from human labour. This, in turn, leads Steinhoff and his collaborators to the bizarre hypothesis that, under conditions of futuristic full automation of human labour, machines themselves would become value-producing "proletarianised machines," rendering human labour obsolete in a dystopian vision of AI capitalism (Steinhoff, Kjosen and Dyer-Witheford 2024). For a detailed exposition of Marx's argument that machines cannot create value within capitalist social relations, see: Caffentzis 1997.

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Od tehnoloških utopizama ka teoriji nejednakog razvoja automatizacije

Apstrakt

Kao protivtežu popularnim prognozama dolazećeg „društva posle rada“ u tekstu tvrdimo da kapitalistički razvoj tehnologije vodi ka nejednakom uvođenju automatizacije u proizvodne procese, koji u centru kapitalističkog sistema uzrokuje širenje nadničnog rada u sektorima društvene reprodukcije i cirkulacije kapitala, a na periferiji u sektoru radno-intenzivne proizvodnje. Diskusiju vodimo kroz kritičku analizu teorije italijanskog pokreta operaizam, čiji razvoj pratimo putanjom „od zvaničnih marksizama ka reinterpretaciji *Kapitala*, od *Kapitala* ka *Grundrisse* i nazad na *Kapital*.“ Operaisti su napravili epistemološki prelom u istraživanju odnosa između proizvodnih snaga i proizvodih odnosa upućujući na kapitalistički razvoj tehnologije kao ključno mesto klasne borbe, te su proizveli teorijski plodotvornu distinkciju između koncepata tehničke kompozicije radne snage i političke kompozicije radničke klase. Uvodeći koncept društvene kompozicije radne snage želimo da ukažemo na izvesne negativne tendencije operaističke teorije, koje su rezultirale u njenoj vulgarizaciji od strane post-operaista, ali i da je istovremeno korigujemo u skladu sa savremenim procesima akumulacije kapitala na svetskom nivou.

Ključne reči: automatizacija, nejednak razvoj, operaizam, tehnička kompozicija radne snage, politička kompozicija radničke klase.