

REVIEW ARTICLE

## WORK BY DATA, RULE BY DATA

Corrado Pasquali

*Department of Law, Università di Teramo, Italy.*

**\*Corresponding Author: Corrado Pasquali**

**Abstract:** This paper focuses on three main questions. What is the role of tacit knowledge in the production of economic value? Can we describe the key changes in the ways that our species organised the production of value in terms of increasing codification of knowledge? How does the codification process interact with and sustain the social functions of power and control?

**Keywords:** *Control, Tacit knowledge, Fordism.*

### THE COGNITIVE UNCONSCIOUS

Psychologists, neuroscientists, linguists, philosophers, economists and legal scholars have long recognized the role of knowledge and cognitive abilities that agents are unaware of while they actually use them in processing information (Kahnemann and Tverski, 2000), taking decisions (Gigerenzer, 2007), learning (Reber, 1998), and following rules and norms (Sacco, 2015).

As psychologist Arthur Reber puts it in describing some of his experiments: "People did not seem to know what they knew nor what information it was that they had based their problem solving or decision making on." (Reber, 1993).

From a social science perspective, Michael Polanyi has recognized the role of knowledge that lies outside the realm of propositional expressibility. Polanyi stressed that the main feature of "tacit knowledge" is its impossibility of being expressed via an unambiguous, transferable code, Polanyi (1966).

Non-codified knowledge is "knowledge embodied in the flesh" that can't be disembodied from its actual bearer; it is knowledge whose tacit dimension is such that its transmission and sharing are close to impossible.

### KNOWLEDGE IN THE FLESH

The key point comes to the fore as soon as one considers knowledge as an economic good: as such, it is produced, exchanged and used in every value-producing process. Under this perspective, the degree to which knowledge is or can be codified is key for the possibility of using it in production independently of its actual bearers.

For instance, consider Jo"el Robuchon's purée: the code needed to produce it is its recipe but some of the relevant knowledge will lie outside the code and remain uncoded in a tacit form in M. Robuchon hands.

In turn, this means that producing an additional unit of Robuchon's purée would be hard and most costly given the imperfection of the code and the amount of tacit knowledge behind it. On the other hand, consider producing an additional unit of John Coltrane's *A Love Supreme* on Friday, November 29 2023.

To do this we can rely on an mp3 file that is a complete code of that masterpiece: its degree of tacitness will be zero and reproduction will be most easy, perfect and at close to zero costs. In a sense, the code and the good to be reproduced do actually coincide.

## KNOWLEDGE IN THE HEAD MANAGEMENT

In his masterful analysis of technological innovation in the Malthusian world, Stephan Epstein claims that premodern technical knowledge had a largely experience-based character and was mostly non-codified. Epstein he argues that "the principal, endogenous bottleneck to premodern technical diffusion and innovation was the cost of person-to-person teaching and demonstration" (Epstein, 2003; Epstein, 2004).

Epstein also discusses how the preindustrial world-given the whole class of limitations and constraints relative to the ways that technical knowledge could actually be expressed, used and transmitted -- developed a whole set of institutions and practices to make the process relatively easier and more effective. In this perspective, his narrative of the way the flying buttress was developed in building cathedrals such as Chartres' or Milan's is fascinating and illuminating.

In the perspective I am trying to explore, Taylorism is the highest point of a long process of substituting codified knowledge for craftsmen artisanal knowledge. Here, I shall substitute Frederick Taylor's words for mine: "This mass of rule-of-thumb or traditional knowledge may be said to be the principal asset or possession of every tradesman. Now, [...], the managers recognise frankly the fact that the 500 or 1000 workmen [...] who are under them possess this mass of traditional knowledge, a large part of which is not in the possession of the management" (Taylor, 1911).

Relative to my perspective, Taylorism amounts to moving knowledge from the shop floor to the managerial headquarters: managers and engineers are the ones who should know how to do things and how they should be done in the best way. Bruno Settis offers a detailed reconstruction of this uninterrupted expulsion of artisanal knowledge from production processes: Highland Park to River Rouge, (Settis, 2016).

Not only knowledge moves from the shop floor to head management: knowledge is followed by power and control. As Antonio Gramsci puts it in a most famous and most quoted sentence of its text *Americanismo e Fordismo*: "Hegemony is born in the factory

and it only requires a small quantity of professional, political and ideological intermediaries for its exercise" (Gramsci, 1934).

The separation of planning from execution translates into wiping out craftsmen's knowledge from the production of value and into the adoption of those productive techniques that not only increase productivity but, at the very same time, enhance control over work processes and over workers. The social function of control is way easier when knowledge of "how to do things and produce value" is perfectly coded, when the code is in the hands of managers and engineers and when codified knowledge is finally embodied in physical capital rather than left uncoded in the hands of craftsmen.

## CONTROL

Two phenomena are of utmost importance here. First, from the advent of the assembly line on, power is more and more found in the possession of knowledge in its codified form. Second, as labor increasingly becomes the mere material execution of the coded processes and skills, the relevance of control and supervision of human labor becomes essential. In particular, the fact labor sticks and adheres to "best practices" is of paramount importance. The codification of knowledge, its embodiment in physical capital is the very ground for measurement, control, reduction of uncertainty and effort observability. Coding of labor is one of the manifest faces of economic and political power.

As to the intrinsic non-contractual nature of the labor extraction process, Ronald Coase is utterly resemblant and consonant with Marx' ideas. It is well known how one of the central tenets of Coase's work is the recognition of firms as social actors whose inner logic is represented by power and command rather than by the price system: "islands of conscious power in this ocean of unconscious cooperation like lumps of butter coagulating in a pail of buttermilk". Firms and factors within firms do not behave nor are they used via the price system: "If a workman moves from department Y to department X, he does not go because of a change in prices but because he is ordered to do so. [...] the distinguishing mark of the firm is the suppression of the price mechanism".

As Samuel Bowles note, Coase “defined the firm by its political structure”. In the fifties a model of the employment relation based on a coasian perspective was built by Herbert Simon. In his model, Simon describes a labor contract as an exchange in which rights are exchanged for a wage. Simon pointed out that “in an employment contract certain aspects of the worker's behavior are stipulated in the contract terms, certain other aspects are placed within the authority of the employer.” The key point is that uncertainty relative to tasks required to be performed by the worker over the course of a contract and the following high costs relative to complete contracting give an advantage to the employer. In the Grundrisse, Marx clearly expresses the view that an employment contract is not about actual labor (or “effort” to use current microeconomics terms) but rather about the sheer number of hours in which an employee agrees to obey to an employer’s authority. Coase subscribes to the very same logic: “[...] what are traded on the market are not, as it is often supposed by economists, physical entities, but the right to perform certain actions.” It is thus of capital importance to note that while the number of hours for which an employee trades his rights for a wage is regulated by a contract while effort is an utterly non-contractual issue. Effort (“labor” in marxian terms) is the profile under which every employment contract is incomplete. A worker actual and concrete supply of effort (his labour power put in exercise) is not at stake in an employment contract: the whole thing is not about contracting but rather about “appropriation of labor by capital” and this “only by misuse could have been called any kind of exchange at all.” As a matter of fact, Marx also stressed that an increase in wage might even reduce the cost of labor: “The rise in wages may be unaccompanied by any change in the price of labour, or may even be accompanied by a fall in the latter.” However, the question becomes: what is the reason that control rights confer power?

Contractual incompleteness is the ultimate cause of the fact that a firm is a political institution. This amounts to saying that what is not contracted upon is obtained (or “extracted” in marxian terms) by the employer by means or command and authority. Under this perspective, a firm is a “mini command economy” in which someone has authority to command someone else to do

something. However, this is not enough as authority is not yet power. In other words: how come orders are obeyed? And more to the point, how come one finds power in a competitive economy in which everything should be a voluntary contract mediated by a price? Indeed, the major issue here is that power is not confined to politics: its social function is actually pervasive in the economic realm as well: as a matter of fact it can even be found exercised by employers on employee in the equilibrium of a competitive economy. Three points are at stake here: first, starting from the industrial revolution, power is conferred to employers and orders are obeyed by employees as a consequence of the separation of labor from means of production; second, as a consequence of contractual incompleteness employers’ power over employees is essential for profit making, in particular, profits are originated from ownership of capital goods and control over production processes; third, power is sustained by equilibrium unemployment. Only in a possible world different from ours it holds true that “[...] it really does not matter who hires whom; so have labor hire capital.” In our actual world, J.K. Galbraith question still needs to be answered: “why power is associated with some factors of production and not with others?”

The labor process-any labor process-is given shape by both a social organization of production and a technology, these two related by a wide set of institutional complementarities. First and foremost, organization and technology are functional to the need of a political resolution of the fundamental conflict between employers and employees of wages and effort. As such, the way that the labor process is organized is determined by the search for profits on the one hand and on extracting the greatest possible quantity of labor from labor power. Under this perspective, control systems are established in the workplace to enhance employers’ ability to extract work and in the end they are institutional forms on which authority and command relations within firms are based upon.

Under the technological perspective, it is fairly evident that the classes of available technologies do impose limits and constraints as to the possibilities given to employers to organize production. At the very same time,

however, employers 'need to extract work from employees actually influences as a primary force the direction of technical change along those paths that favor, foster and enhance the effectiveness of the extraction process. Technical change has a strong bias towards the two main ways of reducing labor unit cost: raising efficiency and or making labor extraction more effective (upon reflection, two sides of the same coin). As a matter of fact, economic history gives ample and robust empirical evidence for the fact that the social organization of work, as based on technology to the extent that this shape different forms and possibilities of power and control, is not determined by efficiency as much as it is from profitability.

It looks like this lesson have been well learned by the Detroit marxist Henry Ford when in 1914 he announced that he would have paid a minimum wage of five dollars for a eight hour workday thus both more than doubling current wage rates, while not facing any shortage of labor supply, and cutting the length of the workday. As reported by Raff and by Raff and summers, profits rose and Ford witnessed a more than twofold increase in output per hour of production work. At the very same time, while in 1913 Ford's employees amounted to 13.623 people the same labor force grew by one third with sharply declining numbers in quitting workers and fired ones. It is hard to explain such changes and of such an order by ordinary variations: explanations of Ford's decision might be traced back to a whole variety of causes. One thing is however true: hardly can Ford's "five dollars a day" be reconciled with the view that in order to maximize profits a firm has to pay an employer a wage that equals his next best alternative. In particular, hardly can Ford's decision be reconciled with the view that a firm is a feasible production set in which a mix of factors are selected in such a way that owners 'wealth is maximized thanks to buying and selling in a perfectly competitive market at exogenously given prices. According to Ford's words, a totally different perspective was at stake: "There was [...] no charity in any way involved [...]. We wanted to pay wages so that the business would be on a lasting foundation. We were building for the future. A low wage business is always insecure [...]. The payment of five dollars a

day for an eight hour day was one of the finest cost cutting move we ever made".

Ford's decision appears to be perfectly in line with Marx's claim that given that only labor power is subject to a contract but not labor (effort) it might even be true that an increase in wage might even reduce the cost of labor (effort) as it somehow alters the costs of labor (effort) extraction. As such, the determination of wages does not seem to work as described by the theory: flexible wages do not clear the labor market nor do they eliminate involuntary employment, at the same time, wage differentials are pervasive while they should disappear for workers with the same productivity (this latter fact implying that employers would only hire low wage workers thus creating an excess supply of high wage workers).

A more credible theory-one that would seriously take into account the previous observations-should be complemented with a few fundamental causal relations. The latter are, to different extents, described by a class of models variously known as effort regulation, labor-discipline or efficiency wages models. In a sense, to put it bluntly, they all capture the idea that labor resists consume while a bottle of Dom Perignon does not.

As we saw, labor (that we henceforth shall call "effort" to adopt modern microeconomics terminology) is not and cannot be regulated by a contract as it is not even observable by an employer (that we henceforth shall call "principal" to adopt modern microeconomics terminology) nor it is even verifiable. Even if this would not hold, any contract in which wage would be a function of some necessarily imperfect measure of his effort such as output would allocate too much risk on the worker (that we henceforth shall call "agent" to adopt modern microeconomics terminology). However effort is the main actor of the underlying production function not "hours of work traded". A possible way out could be represented by having every agent be a residual claimant or having optimal team contracts. However, being a residual claimant and thus having a wage directly and totally related to output would represent an unbearable risk for agents (which are normally taken to be risk adverse).

On the other hand, individual production appears highly unrealistic as economies of scale are pervasive and do play a key role in modern industrial economies inasmuch as they make individual production unrealistic.

Given that wages and control are among the most effective ways to extract labor from labor power, one should ask which of the two is more widely adopted by firms, which of the two is more efficient and under which conditions. Samuel Bowles, has stressed that firms tend to prefer costly investments in control (thus increasing  $p$ ) rather than paying higher wages (given a wage level sufficient to labor extraction). Higher wages are not a waste of resources for society as they are a transfer from employers to employee. Quite on the contrary, control related costs do actually consume real resources and, indeed, the capitalistic firm as an institution, has been described by many as an institution whose main *raison d'être* is its increased possibility of control rather than superior technological efficiency. If higher wages would be paid and, at the very same time, fewer resources were spent on control those resources could be freed and used for production. The latter proposition is proved by Bowles in the following terms: "The Nash equilibrium resulting from profit maximization by the principal and utility maximization by the agent is both Pareto inefficient and technically inefficient. [...] And taking the Nash equilibrium as the status quo, it would also be possible to revise the employer's labor discipline strategy-reducing monitoring and raising wages, for example-such that the same output could be produced with less of one input (monitoring) and not more of any input."

In a sense, monitoring costs do not fit well with profit maximization and they would not be necessary at all if only levels of effort could be perfectly enforced by a contract. Baker and Hubbard offer a most interesting example. In the eighties, some US trucking companies equipped their trucks with computers with the aim of monitoring drivers' behaviors and actions. These computers allowed companies to have detailed information on a quite remarkable set of drivers' and trucks' operations: mostly those in which a conflict of interests was more relevant for the company itself such as speed, idle time and the like. So, for instance,

drivers generally prefers to drive faster so they can take longer breaks but the cost of operating trucks is increasing and convex in the speed of the truck. On the other hand, drivers that were also truck owners and thus residual claimants on net revenues internalized all the costs did realized significant savings (and, indeed, they successfully competed with companies' trucks that faced a significant divergence between drivers' and companies' objectives). The key point is that these computers did not provide any improvement-say a more effective coordination between drivers and dispatchers-in the service whatsoever: their main and probably sole function was rather to enlarge the domain of contractibility: the space of drivers' behaviors-first and foremost those behaviors that more heavily conflicted with companies' interests-that could be enforced by a contract thanks to making them observable and verifiable. We thus observe a use of technology that by enhancing the possibility of enforceable contracts enhanced profit rates (without producing any other benefit nor improving the service's quality). Key question is: why not adopting a wage increase coupled by a decrease in the costs of monitoring? After all, the same level of effort might have been obtained (according to theory).

### WORK BY DATA, RULE BY DATA

Just as a quick instance of new ways of control and coding, it is worth considering how a simple act such as tightening a bolt in the most advanced factories in the automotive sector has been transformed. As of 2020, workers use a particular kind of smart torque wrenches that are equipped with an "Internet of things" technology. Wrenches are connected to a cloud that analyses (i.e. codifies) each and every action a worker performs. Data relative to speed, work pace, force applied in tightening a bolt and much more are stored in a cloud and furtherly analysed. In addition, smart torques can actually stop functioning whenever tightening has reached the desired (optimal) force. This is just but one quick example of a huge phenomenon: speed, strength, pace dictated by physical capital: the bearer of codified knowledge, the code in the machine.

No words could ever do better than Louis Ferdinand Celine's from the *Voyage au bout*

*de la nuit*: «[Idots] monsieur, j'ai de l'instruction et meme j'ai entrepris autrefois des études médicales [...]». Du coup, il m'a regardé avec un sale oeil. J'ai senti que je venais de gaffer une fois de plus, et à mon détriment. «Ça ne vous servira à rien ici vos études, mon garçon! Vous n'êtes pas venu ici pour penser, mais pour faire les gestes qu'on vous commandera d'exécuter...».

## REFERENCES

1. Epstein, S. R.,(2003), "Transmitting Craft Knowledge in Premodern Europe", Mimeo, London School of Economics.
2. Epstein, S. R., (2004), "Property rights to knowledge in premodern Europe, 1300-1800", *The American Economic Review*, Vol. 94, No.2, pp. 382-387
3. Gigerenzer, G., (2007), *Gut Feelings: The Intelligence of the Unconscious*, Viking–Penguin Group, New York.
4. Gramsci, A. "Americanismo e Fordismo", in *Quaderni dal Carcere*, Vol. 3, Quaderni 12-29, Edizione Critica dell'Istituto Gramsci, Gerratana, V. (ed.), Einaudi, Torino, 1977.
5. Kahneman, D., Tverski, A., (2000), *Choices, Values, and Frames*, Russell Sage Foundation, New York.
6. Polanyi, M., (1966), *The Tacit Dimension*, Doubleday, Garden City NY.
7. Reber, A. S., (1993), *Implicit Learning and Tacit Knowledge. An Essay on the Cognitive Unconscious.*, Oxford University Press, Oxford-New York.
8. Reber, A. S.,(1989), "Implicit learning and tacit knowledge", *Journal of Experimental Psychology*, Vol. 118, pp. 219-235.
9. Sacco, R., *Il Diritto Muto*, Il Mulino, Bologna, 2015
10. Taylor, F. (1911), *The Principles of Scientific Management*, Harper and Brothers, New York - London,