

Towards a new ecological and human type of national accounting for developing economies (The CARE/TDL model)

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Abstract

The goal of this article is to show how today's financial accounting system, notably the IFRS (International Financial Reporting Standards) and the related National accounts (primarily the famous GDP, Gross Domestic Product), are the main causes of today's human and ecological crisis. This assertion is justified on the basis of an historical survey of the development of capitalist accounting since the end of the Middle Age, the time of its foundation. We prove that, in the form it was invented by big capitalists at that time (and used until today), the concept of capital-debt to be conserved has nothing to do with the one used by economists of either classical, neoclassical, or marxist schools and that it is a very dangerous weapon against the interests of the mankind and ecology.

Keywords: green national accounting, environmental accounting, human accounting, green finance, ecological accounting against IFRS.

JEL: M00, M41, Q56.

1. Introduction: The Environmental Kuznets Curve and the BRICS

In her article “Environmental impact of economic growth in BRICS” (2017), Viviana Tedino tests the existence of the Environmental Kuznets Curve (EKC) in developing economies on the basis of a panel data analysis. The EKC, inspired by Kuznets’

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works¹, notably his famous article “Economic growth and income inequality” (1955), states that pollution increases as income goes up and, after reaching a turning point, it starts to decrease. By analyzing the relationship between GDP² per capita and greenhouse gas emissions, she concludes that the EKC curve does exist for China, India, and South Africa whose emissions are now increasing at the same time as the GDP, while the hypothesis does not hold for Brazil and Russia. As far as Russia is concerned, its GDP decreased during some of the years included in the study, so for this country and during those years, the EKC hypothesis cannot really be tested. Brazil, for its part, is the country that pollutes the least despite its growth, and, according to Tedino, one reason for this could be that Brazil uses hydropower and has introduced renewable energy in its industries. Nevertheless, Tedino ascertains that, due to their World Trade Organization membership and, more specifically, trade openness, levels of emission increased in Brazil, Russia, India, China, and South Africa when they opened to trade in 1995, 2012, 1995, 2001, and 1995 respectively. Consequently, the environmental qualities in these countries started deteriorating in the years following these events. One reason for this is that governments of developing economies are encouraged to lower environmental standards to attract foreign investment and capital which leads to divergence of international environmental conditions.

Another explanation is the pollution haven hypothesis. It tends to show how, in order to reduce costs and expenses imposed by higher environmental standards, developed countries relocate production to countries with lower environmental regulations and lower pollution control costs, worsening, most of the time, the developing country’s environment.

The third explanation is the race to the bottom hypothesis. In order to cope with the pressure of international competition for foreign direct investment, developing countries tend to lower environmental standards and regulations.

Finally, in spite of being clearly influenced by all these theories derived from the EKC “philosophy”, Tedino admits that these types of studies are problematic because “GDP per capita fails to represent welfare, so may be other indicators, such as Human Development Index or Green National Income, would better capture the relationship between environment and economic growth” (Tedino, 2017).

We agree with Tedino, but we go further. Knowing whether the solution to ecological or human problems depends on reaching a turning point in economic growth is not the main problem for us. Rather, we examine adequate regulations made in order to have a systematic conservation of human and natural capitals *during all phases of economic development*. This presents a problem of regulations the dominant economic system imposes (or does not impose), that is, *the capitalist system*. This system, especially its nowadays’ financial variant, is increasingly accused of destroying the very bases of ecological and social, or human, life at all its stages (Favereau, 2014, 2016). Our thesis is that the fundamental cause for this situation lies in the *firms’ private accounting system, reinforced by the national*

¹ Kuznets (1955) showed that during the various economic development stages, income inequalities first increase and then begin to decrease.

² Gross Domestic Product.

accounts system. Today's capitalist economic model is indeed fundamentally based on a very old and dangerous type of accounting: the famous double-entry accounting developed at the end of the Middle Ages that W. Sombart³ (1902) and M. Weber (1920) justly described as the pillar of capitalism. These two famous Germans are among the rare authors of their time that understood the importance of accounting as an instrument of (capitalist) calculative rationality. Back then, though, at a time when national accounts were very rare, they only spoke about private accounting, which was essentially business accounting.

In our work we demonstrate that today this kind of private capitalist accounting has not only "infected" firms' management but also much later, in the 20th century, it has strongly influenced the theories and practices of national accounting in all countries. In this regard, now we can talk about the domination of the *capitalist national accounting system* which fortifies and amplifies the dangerousness of the capitalist private accounting system. These two types of accounting systems *work hand in hand* and lead the planet to catastrophes. The thesis which we defend in this article is that there will be no serious progress in matters of ecological and social affairs without an instauration of a radically new integrated macro-micro system of ecological and human accounting *encompassing both business and national accounts* — a change that will enable a revolution in the management of firms and nations towards an ecological and social co-management. To be constructive, we do not settle for a mere critique of the actual dominant system of business and national accounts; we also propose a radically new global integrated system of human and ecological accounts for both businesses and nations: the "micro-macro CARE/TDL model".

To develop these theses and objectives, our plan will be as follows. In the first part, in order to explain the origins of the problem, we dedicate a short historical survey to the birth and main characteristics of the accounting system which is at the heart of today's ecological and social issues. In the second part, we list the basic principles of a complete reconstruction of business accounts. In the third part, we use these basic principles to deduct corresponding ones for a reconstruction of national accounts aligned with new business accounts. In the fourth part, we show the main past and recent attempts of rebuilding the capitalist national accounting system and compare them with the micro-macro CARE/TDL model.

2. Historical survey: Origins of the problem of today's business and national accounts

Let us pretend we are in Northern Italy in 1300–1400, at the time of the birth of the modern capitalism and creation of double-entry accounting. And let us take a look at how big capitalists of the time, such as the famous Datini, conceived their

³ According to Sombart (1902): "*Capitalism and double-entry bookkeeping are absolutely indissociable: their relationship to each other is that of form to content*". Almost all books on business accounting quote this famous phrase.

accounting system both to conserve their capital and to accumulate profits (see: de Roover (1956) for data on the accounts of Datini; Renouard (1968) for description of life conditions and businessmen’s frame of mind at the time). Knowing the accounting tools the founders of the modern capitalism created and used is crucial to understanding how, even after seven centuries of domination, those tools still give their users tremendous power.

Let’s assume that Datini invests a sum of 1000 in his company. Its opening balance sheet is as follows:

Assets		Liabilities	
Cash money ⁵ (to be used)	1000	Capital	1000

What is fascinating here is that the capital in this accounting system is *absolutely not an asset, or wealth, or resource to be used*, contrary to a classic economic view⁵ (Hodgson, 2014), which is also the view most people share, but money to be refunded: a debt to creditors and therefore a liability of the capitalist firm. In this perspective, cash and assets are means used by the firm while “Datini’s capital” is the particular debt of his company towards him. Extraordinary duplication of the capitalist’s personality: private person Datini lends a sum of money to his company, and the latter, run by capitalist Datini, owes this private person the repayment of this stake! This duplication allows the capitalist to clearly distinguish a “capital” to be used on the assets side and a (*true*) capital to be kept on the liabilities side — a dualism that will underpin the very power and efficiency of the capitalist system. This perspective stems from medieval capital, the “capitalis pars” (Braudel, 1979; Fetter, 1937), to budding capitalism — the “capitalis pars” being the principal part of a debt disconnected from interest (Wood, 2002).

Let us now assume that Datini then buys goods (G) for a price of 1000, which leads to modification of the balance sheet like that:

Assets		Liabilities	
Inventory (or rather purchase) of G	1000	Capital	1000

There is a simple change in the assets’ nature but no change in the capital to be maintained. Now suppose the capitalist sells the goods for 1200. Here is his new balance sheet:

Assets		Liabilities	
Concrete money	1200	Capital	1000
		Profit	200

⁴ Naturally, concrete money does not appear in the balance sheet, only its amount! But traditionally this asset is called “money”.

⁵ This conception of capital as an asset also applies to Adam Smith, Karl Marx (with his famous cycle money — commodity — money), and Stanley Jevons, to cite only three famous economists of very different economic ideologies. Despite all their fundamental clashes, they all agree that capital corresponds to assets!

The profit of 200 results from the surplus after preservation of the capital on the liabilities side; the firm owes the capitalist the profit, and this profit can be consumed entirely to ensure the life of his family without jeopardizing continuity of the company's activities. So, the capitalist has preserved his capital⁶ well. This entire prudent system is based on a valuation dictated by the capital debt itself which means an abstract amount of money is to be reimbursed. This implies that before they are sold, the assets cannot be registered at their potential market value. They have to be recorded at their cost of purchase (with the money derived from the capital invested) or at their production cost which amounts to the so-called cost or historical cost principle. This was already in conformity with another famous principle of classic accounting — the principle of “realisation”: what is not yet realized cannot be held as acquired⁷. This kind of strict valuation mode which refuses market values (or selling price values) was well adapted to these types of capitalists' goals: “first of all, preserve my capital and my firm” — a saying completely at odds with today's financial capitalist philosophy: sell my business (its shares) every day in markets all over the world to earn as much money as possible.

Beyond the owner's accounts, Datini's balance sheet liabilities could include other capital-as-money contributions, for example, those of bankers, generally conceived in the common language as “normal” debts. It is crucial to see that these debts do not have the same status as Datini's capital. The capital-as-money debt owed to Datini is not only related to a strictly repayable “loan”, but also confers *power* to Datini in his business, particularly over his salaried workers (see below). On the other hand, liabilities towards third parties (banks, suppliers) do not imply any power over profit. In summary, Datini's capital and suppliers' debts are all of the same nature, i.e. capital-as-money (money brought to the company and to be refunded in time), but Datini's capital confers a *special right of power* on and in the company. In that sense, we can repeat after Nitzan and Bichler (2009) that capital as a debt is also power.

In the context of debts, “employee-related payables” (salary debts) may exist. At first glance, these debts seem to be of the same nature as those mentioned above, i.e. capital debts both for suppliers and Datini. But they are of a special nature and require specific treatment. If Datini hires an employee to help him, there are two possibilities. In the former case, Datini does not record any salary debts at the time of hiring and waits until the date of the wage payment before he records it. In this case, the employee's cost of use (the wage) does not appear on the assets side of the balance sheet and the accounting is limited to recording an expense, which decreases the expected profit when the wage is paid. If this wage amounts to 100 and is paid at the end of the period, Datini's profit will pass from 200 to 100. In the second case, Datini does the following:

⁶ Note that if during that time Datini had brought more capital to increase his activity, this rise of the assets would not have accounted for a profit, which is why the measure of profit *cannot be based on a comparison between assets during the period*. Capitalists soon understood that they needed a concept of capital as a debt on the liabilities side to correctly calculate their profit. Marx has not seen this fact.

⁷ These capitalists' prudence was such that at the time and increasingly during the 19th century, some of them would record expected losses in their accounts while refusing to register expected profits. But this is a secondary point: we will stick here to the pure “cost principle”.

1. He records the debt to be paid (i.e. the wage to be paid) as soon as the employees are hired and records the corresponding cost as an asset:

Assets	Liabilities	
Asset related to employees (<i>i.e.</i> purchase of work force)	100	Salary debts 100

2. Then, after using the work force and paying off the employee's debt at the end of the period, he crosses out the human asset and registers this loss of asset as a decrease of his profit.

But this option which seems to make the employee an “investment” and which is very much appreciated by the American school of “human resources”, notably by Becker (1964) and Kendrick (1976), leads to the same situation as before⁸. *Finally*, the employees' costs are always an *expense of the capital-as-money*. Moreover, they are also an expense valued according to the fluctuations of a market. As such, they *never appear as a real “capital” to be kept on the liabilities side of the balance sheet*, unlike the financial capital, i.e. capital-as-money. The employee is always a simple *means* which uses and consumes capital-as-money, not an end in itself or “something” to preserve. Therefore the salary debt and all related debts in no way imply an obligation to maintain employees for themselves (Rambaud & Richard, 2017). Even back then, state laws in different cities in Northern Italy already sanctioned employees' status as a simple means without any management power in capitalists firms, such as Datini's. The workers, including those in the textile industry, were perfectly aware they were simple tools in the labour market and they tried to alter that fate several times, notably during the Ciompi revolution in Florence in 1378 (Piper, 1978).

In conclusion, it can be said that in this system which is one of the first developments of capitalism there is only one type of capital to be systematically maintained, or rather only one “nature” of capital — that of the contribution of capitalists and of various lenders of money. This capital is maintained at the company's level. An employee whose “debt” is negotiated on a market is always a means and an expense for the capitalist and this is so since Datini's time. This is what Datini's simplified income statement shows in 1399 (de Roover, 1956):

Expenses	Revenues
Purchase costs of sold goods	+ Goods' sales
Salaries expenses	
Depreciation of buildings	
= Datini's net profit	

Employees' status as a burden to the capitalist (and his capital) is exactly the same today. Take a P&L statement from any current commercial firm: the list of expenses fundamentally remains the same as in Datini's accounts. The structure of this essential document has not changed and continues to fuel the struggle between employees

⁸ In the national balance sheet conceived by Kendrick, human capital is an asset and wages are actual wages (“labor compensation”) as they are negotiated on the labor market, while businesses' equity is a true capital debt on the liabilities side (Kendrick, 1976).

and capitalists. It makes a wage bill (and therefore employment) a factor to be reduced as much as possible, and the word “expense” indicates it well. Therefore, it cannot solve the problem of unemployment; it creates it (Rambaud & Richard, 2017).

Such is this fascinating system of accounts coming from the time of Datini. It has been somewhat revisited by the IFRS⁹ (International Financial Reporting Standards) in recent years. Indeed, after the liberal revolution of the 1970s, the tendency is to partially abandon the old “historical cost principle” in order to enable the valuation of some assets (such as financial assets) at their market value with the desire to express their “fair value”. This trend appears at a time when the influence of an “economic” conception of valuation, as opposed to a classic accounting conception inherited from Dantini’s time, is growing. More precisely, it comes from a “Fisherian” conception of valuation which considers that capital is not an amount of money to be preserved but a resource (or wealth) that produces future services (and profits) and that must be valued on the basis of the discounted amount of these future services¹⁰. This other conception of capital, which was anticipated by Pacioli (1494)¹¹, is totally different from the classical accounting one and, *if applied in a systematic way*, would result in totally different principles of valuation and measure of profit. This new kind of accounting has two advantages (at least in times of economic growth) for the world’s stock players: it gives an idea of the value of their portfolio, and, above all, allows them to record anticipated profits in their accounting statements (Richard, 2015a). As suggested by A. Rambaud, the following schedules sum up these two opposed conceptions of the principle of capital in the history of business accounting.

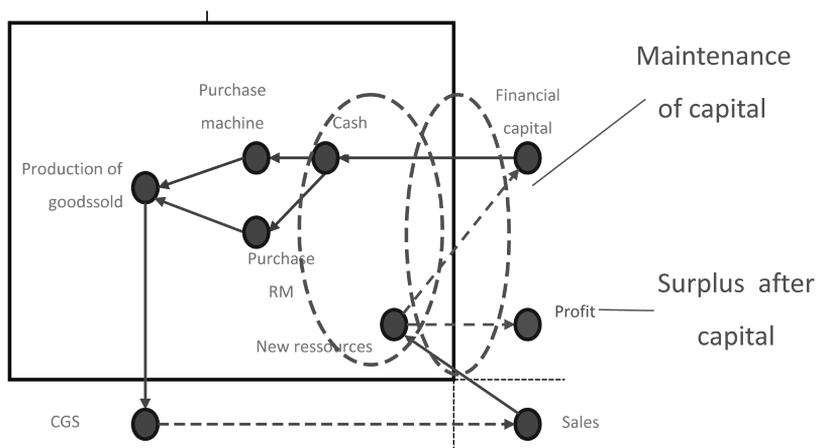


Figure 1. The “classical” model of capital money debt accounting (model 1)

⁹ For any question about the IFRS, see Richard et al. (2018).

¹⁰ See Fisher (2003 [1906]), p. 52: “capital is a stock of wealth at a moment in time” and p. 202: “the value of that wealth or property ...is the present worth of the future income from the specified capital”.

¹¹ In an inedited article, Rambaud (2018) demonstrated that the Fisherian conception was already at the heart of the conception of capital developed by the famous Luca Pacioli, 15th century author of a mathematical treaty that included a chapter on accounting (Pacioli, 1494). But Pacioli was well ahead of his time and his vanguard conception of the capital had to wait for centuries before it could dominate the scene.

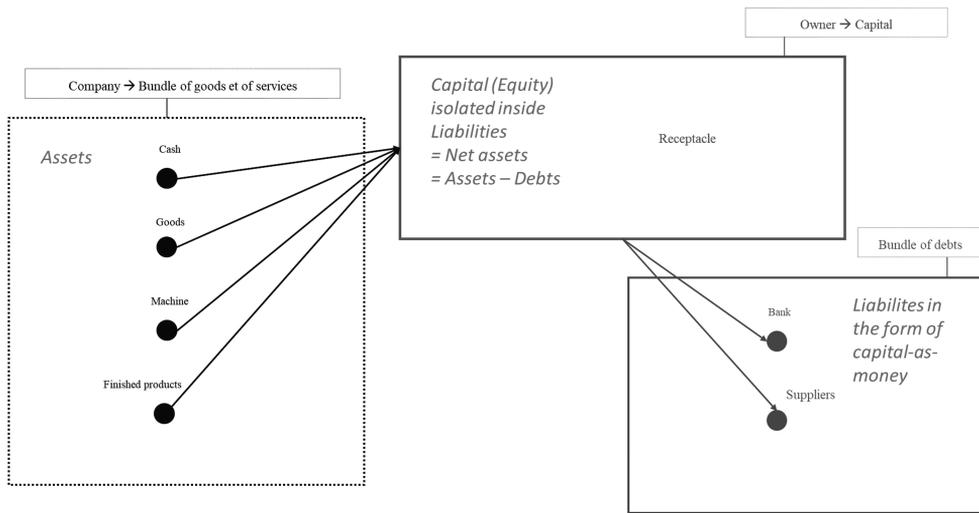


Figure 2. The “modern” Pacioli-Fisher model of accounting (model 2)

Richard (2012) shows that a similar evolution from model 1 to model 2 also takes place in the matters of national accounting (including environmental national accounting). At the time of the emergence of systems of national accounts (SNA) in the years after World War II, notably with the works of Keynesianists Meade and Stone (1941), and during their development between 1945 and 1990, the dominant type of valuation is the cost of factors (Vanoli, 2002). Although most of these national economists who rely on their economic background may regret that these types of accounts cannot give information on the value of the capital (assets in the “normal” understanding of these economists)¹², it is only around 2000 that a strong influence of the Fisherian theory of capital begins, notably in 2001, with the publication of “Measuring capital” by the OCDE, and with the elaboration of the SCN in France in 1993. According to Vanoli (2002), it is at this “turning point” that national accountants started to embrace/adopt the positions of economists and reject more traditional accountants’ conceptions. This new trend culminated in multiple publications of the United Nations Organization (UN, 1996, 2003, 2013) and different works of the World Bank (2000, 2006, 2011), especially the famous 2006 book “Where is the wealth of nations?”. If we take these examples into consideration, it can be asserted that the influence of the Fisherian ideas is much stronger in the field of national accounting than it is in business accounts. It can also be said that the type of accounting system the World Bank proposed represents an “ideal type” for what could be the development of the IFRS in the future if it were conceived in order to calculate the value (i.e. the Fisherian value) of businesses (Richard, 2012). But it is not the case today because the IFRS enforce the exclusive use of the Fisherian valuation for financial assets and not for assets as a whole. Consequently, this type of business accounting fortunately

¹² See notably the case of Kendrick, who clearly prefers market values but chooses real costs when market values are not available (1976, p. 18).

remains largely based on the classic conception of accounting¹³. That is why nowadays, despite many fruitless attempts at destroying it, the classic accounting conception continues to dominate the economic system around the world including the systems of national accounts, as they often remain based on business accounts (see below). As for the subject of national accounts, later we intend to dwell on the influence of the capitalist business accounts upon national accounting, but now we must state that the concept of added value, which is at the heart of most national accounts (used to calculate the famous GDP or NDP), is entirely based on the concepts of profit and wages developed by the first capitalists, such as Datini. In this sense, national accounts are fundamentally a by-product of capitalist business accounts. Beyond this provisory allusion to the problem of national accounts, the main lesson we can draw from this short historic survey is that the only thing the founders of capitalism selfishly treated as a capital to be preserved was financial capital, and they dismissed the so-called “human capital”. As regards the “natural capital”, this kind of capital was obviously not considered an object of registration at the time since the state of its degradation had not yet reached today’s catastrophic level. Of course, it did not appear at all in the capital-debt concept of their balance sheets, which unfortunately remains the case today.

The next part of our article is devoted to correction of serious defects inherited from this obsolete accounting model which is immoral, iniquitous and anti-economic.

3. The principles of business accounts reconstruction

The “strategy” that is used in our attempt of reconstructing business accounts relies on re-appropriation and re-interpretation of the old capitalist system of double-entry accounting, so it can better preserve human and natural capitals, the way some martial arts use the strength of one’s enemy to defeat him! To be short, instead of treating only financial investment as a true capital-debt like Datini does in his accounting system, we enlarge that protection to the human and natural capitals. To develop this method and reach this goal, we lay down twelve basic theses and principles that constitute the foundations of our micro CARE/TDL¹⁴ model¹⁵.

1. *First thesis and principle.* We define a capital as “a thing”, material or not, offering a possibility of using and recognized as having to be maintained over a certain predetermined period of time. This definition implies that all kinds of (true) capitals are to be considered as *liabilities (debts of conservation)* and not as assets (or resources) to be used (as it is almost

¹³ It can also be emphasized that even though the IFRS theoretically defines capital in a Fisherian way as (net) assets, they, quite contradictorily, continue to treat new adjunctions of capital as new debts (Richard, 2015b).

¹⁴ CARE: Comprehensive Accounting in Respect of Ecology. TDL: Triple Depreciation Line.

¹⁵ During the period between the early versions of the CARE model (in 2008–2012) and the present CARE/TDL one (2015–2017), many important improvements were made, but the fundamentals remain the same: see Richard (2008, 2012), Rambaud and Richard (2015a; 2015b), Rambaud (2015). Experimentation with the CARE/TDL model has been recommended recently in France by different reports to the French government, notably the Notat-Sénard report (2018).

always the case in the economic literature and practice). In more philosophical terms, a capital is not a means but an end in itself. The immediate consequence of this definition is that it is impossible to imagine compensations between different types of capitals that will allow the improvement of some types of capital at the detriment of others. To put it another way, the CARE/TDL method relies on a conception of strong sustainability, not on a conception of weak sustainability that allows compensations between different types of capital, such as financial, natural and human ones¹⁶. In another thesis (see below) we specify that this sustainability approach is a strict one that does not allow compensations made *inside* the same type of capital, at least as far as human capital is concerned, and also in the case of natural capitals that are a condition of preserving the biosphere. With this specific definition of capital, firms' capital will represent the (true) liabilities (or debts) of these entities in relation to different providers of capitals: all these borrowed capitals should be maintained and "reimbursed". We believe that this conception of capital is at odds with practically all the current models of accounting, even those that proclaim that they are environmental ones.

2. *Second thesis and principle.* It is the task of a democratic society to determine what things should be considered worthy of being systematically preserved. But in this article, there are *at least* three types of capitals that should be considered as such: natural, human (encompassing social one) and financial capitals. The natural capital should be understood as the things (living or not) without which human life could potentially be endangered. Several philosophers, e.g. Norton (1991), agree with this position, no matter how anthropocentric it may be. Our enumeration of capitals begins with the natural capital. This is not a random starting point: we consider the natural capital as the basis for the biosphere, which is the basis for the other two capitals, and its conservation must be the priority.

3. *Third thesis and principle.* We need to use a double-entry accounting system with a new kind of a balance sheet in which the right side is devoted to registration of capitals to be preserved (or liabilities) and the left side to registration of assets (or resources). These assets are defined as "things", material or otherwise, available to be used to meet certain needs or desires. Our thesis is that without this double view of the capitals to be preserved and the corresponding assets (employment of capitals) to be used it is clearly impossible to effectively protect the different capitals in the frame of an ecological society. As we have seen, this thesis can be defended on behalf of the very historical experience of capitalism which has invented a kind of double-entry accounting to enable the conservation (and hence the accumulation) of its own (and sole) financial capital. Consequently, thanks to this new kind of balance sheet accounting, the two other types of capitals will be placed on an equal footing with financial capital.

4. *Fourth thesis and principle.* The creation of this new national balance sheet relies on diverse economic and social actors, notably and mainly companies which this article

¹⁶ Dietz and Neumayer (2007, p. 619) give four types of reasons in favour of a strong approach to sustainability on environmental issues: ethical ones, risk and uncertainty, irreversibility, and risk aversion.

considers the main cause for today's ecological and human situation (see below). As is already the case nowadays all over the world in the matters of financial capital (Richard et al., 2018), accounting laws should bind all these key actors to adopt this new, enlarged conception of capital in their own entities/subsidiaries and hence in their own balance sheets or equivalents (see below). Our thesis is that it is very difficult to achieve effective ecological and human accounting of a good quality without the collaboration of all the entities that constitute a nation as national accounting is, in a sense, essentially the sum of different accounting entities on domestic, local, and regional levels. That is why we use a bottom-up approach rather than research information made by central authorities alone. For instance, in many cases it is impossible to depict conditions in which human and natural capitals are used at the state level. Let us focus on the case of soils to be maintained: their composition and reactions to pollutions are so diverse that only a study at a local level will allow a serious analysis of the ecological problems (Ionescu, 2016; Bicalho, 2006). However, a more pragmatic view is necessary as, in some cases, a problem has to be handled on the national level (see below).

5. *Fifth thesis and principle.* A guarantee of true preservation of human and natural capitals is impossible without an ontological examination of the nature of these capitals, independently of how useful they may be to those who use them. The goal is to *understand* what these capitals really are and how they naturally function in the frame of the reproduction of the entire biosphere. In the matters of natural capital, the main task is not to *study* if and how men can draw economic services from these cycles. On the contrary, the task is to study how permanent renewal of structures and functions of biological cycles are maintained to enable preservation of biodiversity, which is the basis of all life on earth (Griffon & Weber, 1996). If we accept this kind of reasoning which gives the priority to the natural and human capitals in themselves (and not as an economic means) the following step is to understand in what cases and conditions viability of these capitals is endangered (Holling, 1973; Walker et al. (2004); Levrel (2007) and their literature on the concept of ecological resilience¹⁷). Issues of human resilience also arise when the workforce's conditions are threatening their health or, more generally, preventing them from having a good life (see below for practical examples). Two types of people will undertake this complex task: scientists (for instance, ergonomists and doctors will tackle human capital, while ecologists will study natural capital) and also people who have good understanding of these capitals as well as a specific interest in their preservation, notably trade-unions. This has nothing to do with the analysis of "environmental functions" initiated by Huetting (1980) and subsequently defined by de Groot (1992) as "the capacity of natural processes and components to provide goods and services that satisfy human needs".

6. *Sixth thesis and principle.* Human and natural capitals are observed here in order to deduct conditions of their resilience and standards for their use so as to enable their

¹⁷ It can be defined as the maximum intensity a system can withhold without changing its behavior, therefore keeping intact its structures, functions and responses.

preservation. Scientists' goal is to define the thresholds where there is a risk of loss of resilience if they are trespassed. Considering how difficult it is to precisely define these thresholds (since they can considerably vary from one place to another, as stated previously), setting prudent limits on the way these capitals should be used sounds like a pragmatic solution. An even better one is to define ranges for their use. These ranges are to be conceived so as to make anticipation of the risks of non-resilience possible and to give the entities those risks may concern a warning, so the risks can be avoided (in this respect, see the interesting works by the Swiss school of eco-points, notably Müller-Wenck (1972) and, more recently, for application in the field of biodiversity accounting, Ionescu's thesis (2016)). It is impossible to assign a real goal to any ecological and human management unless we want to manage blindly, without any definition of these norms (standards). Their importance for an ecological and human conception of economics was already stressed in the 1950s by initiators such as K. W. Kapp (1950) with his revolutionary proposals to depreciate both human beings and whales (Richard, 2015c), and Ciriacy-Wantrup (1952) with his concept of "the safe minimum standard" (SMS). They were reformulated by Hueting (1989) and developed by Ekins and Simon (1998) who promoted them as a central element of their interesting model of "strong sustainability" (see below). In the context of our bottom-up philosophy, the firms themselves will largely be the ones defining these ranges under supervision of specialized and independent auditors, as is already the case in traditional business accounting for a lot of matters, amongst which are depreciations of financial capital. But this is a flexible rule. In the cases of some worldwide phenomena, such as the emission of greenhouse gases, international and national levels provide a better standpoint to undertake these observations and define the conditions of resilience. More generally, though, cooperation of local, regional, national, and international entities will often be necessary to define these norms. A good example of that cooperation is the case of the definition of norms for the preservation of human capital¹⁸ (and its good life). It is necessary to take the general principles defined by the ILO (International Labor Organization) into account and then adapt them to the national, regional, and local situations.

7. *Seventh thesis and principle.* A comparison between the current situation in matters of preserving natural and human standards by the constitutive parts of the nations (chiefly businesses) and the defined local, regional, and national or international norms of sustainability allows these "stakeholders" to record gaps between their practices (pollutions, consumptions, employees' wages...) and the natural and human standards that they are supposed to respect. The philosophy behind this reasoning is the same as the one already initiated by authors such as Ciriacy-Wantrup, Kapp, Hueting, and Ekins, with the specification that, in our conception, the calculation of sustainability gaps is effectively extended, for instance, to the human capital and made within the frame of a true micro-

¹⁸ The concepts of preserving human capital and proper life must not be equated to minimal income or existence income. Moreover, strictly speaking, the pay corresponding to the preservation of human capital is not an income. Income begins beyond the preservation which must already allow for a normal and good existence (see below).

macro accounting system. We are systematically dealing with both Ecological Sustainability gaps (ES gaps) and Human Sustainability gaps (HS gaps).

8. *Eighth thesis and principle.* In the case of the existing human and/or natural Sgaps (or rather of Sgaps' risks), the entity responsible for these Sgaps (possible Sgaps) has to find what measures it needs to take to return the things that are to be preserved to a resilient state (if it is not too late) or, better, to stop the causes of these possible Sgaps, generally within a certain time frame. Consequently, it also must calculate the budgeted cost of this (these) measure(s) for each concerned component of HC and NC. These different costs are called "budgeted sustainability costs" (BSC). If an entity has an activity that respects conservation of the natural capital without supplementary costs above the pure financial costs, it is considered BSC free. Obviously, this cannot be the case for human capital which must receive at least a pay corresponding to its conservation.

9. *Ninth thesis and principle.* The BSCs for different elements that constitute the human capital (above all, the sum of the pays for the conservation and proper living conditions during the budgeted period) constitute the global human capital, i.e. the human debt the entity owes for the period considered. This human capital (capital/debt) is registered on the liabilities side of the balance sheet (in the same way as financial capital debt appears on the liabilities' side under the name "financial capital" on every balance sheet today). Similarly, the BSCs for the different elements that constitute natural capital constitute the global natural capital, i.e. the global, ecological debt of the entity. This global natural capital is registered under the name "natural capital" on the liabilities' side of the BS. As opposed to the capitalist balance sheet, the new balance sheet thus appears to be *divided into three main strictly separate parts*, or areas, on its liabilities' side: financial capital, human capital, and natural capital (all of them capital/debts). We can see that under the hypothesis of a true strong sustainability, compensating is impossible not only within the human capital and the natural capital "areas" but also within the numerous components of each of these two types of capitals. For example, although it is the case today with the traditional GDP, one cannot imagine that high wages and benefits of top managers could compensate for miserable wages of "bottom" workers. Similarly, in the times of a massive and dangerous destruction of the biosphere, one cannot think that destruction of fishes could be compensated by breeding of cattle. In a nutshell, beyond the subdivision into three main capitals, the new balance sheet is actually made of a myriad of new capitals. Thus, within the frame of an extended national balance sheet, some kind of an "explosion" of capitals occurs!

10. *Tenth thesis and principle.* At the same time, when these three kinds of capitals are registered on the liabilities' side of the balance sheet, three types of assets (more precisely, these assets' costs) appear as their counterparts on the assets' side of this same balance sheet. We show in detail the continuation of the demonstration in the following part. We believe that the use of the three categories of assets gives way to three separate types of depreciations (if admitted that the assets are detained for several years). These (separate) depreciations of the three types of assets classically have three separate types of depreciation expenses (charges) as counterparts that represent the diminutions of the

three types of capital respectively¹⁹. These expenses as a whole form a true and that has full financial, ecological, and human cost which has nothing to do with the actual financial cost that regulates the fixation of prices on the markets. In this sense, a new type of regulation of the markets will emerge.

11. Eleventh thesis and principle. The full cost described in the previous thesis is the basis of a new definition of prices and profit (see below for more information). Let us assume for now that the price is just covering the full cost. Once the products elaborated in the frame of these new conditions are sold, some new resources appear in cash as a counterpart of revenues. Usually, these new resources are allocated to three separate “cash boxes” that are to become means of investment or reinvestment in the three types of assets that are used and must be maintained. Thus, normally, the three types of capitals are preserved, each one separately, as are the numerous capitals they contain. If it is not the case, the CARE/TDL balance sheet immediately shows there is a discrepancy between the cost “value” of the concerned assets and the corresponding “value” of the capitals registered on the liabilities side. It means this type of accounting is a powerful instrument of information on whether the reimbursement of financial, human, and ecological debts is respected (see below for an example).

12. Twelfth thesis and condition. Although it is not this article’s main purpose, we have to say a few words on how deeply the appliance of this new kind of micro accounting will affect companies’ governance. Indeed, since each type of capital has its own depreciation expense, salaries (wage expenses) will no longer exist²⁰. In today’s capitalist society, “depreciation” of the human capital is depreciation of the financial capital, that is, a payment (expense) which features the use of salaried people by the financial capital. On the contrary, in the new ecological and human CARE/TDL accounting system, each capital has its *own expenses*. Notably for that reason, the human capital no longer appears as a charge of the financial capital. This new capital appears as a true capital/debt, potentially with the same rights of firm governance as the financial capital. CARE’s conception of equality of treatment of the three types of capitals logically makes these three capitals equally powerful as far as firm governance goes, with the appearance of an ecological and social co-management led by representatives of the three new categories of “capital holders” (Richard, 2012, 2015b). This will be a new “capital holder theory” based on the CARE/TDL model. This new theory of firm governance based on an accounting system is much more precise²¹ and far-reaching than the famous “stakeholder theory”

¹⁹ Kendrick (1976, pp. 6–30) taking into account a “depreciation of the human capital” has nothing to do, except for formal resemblance, with the CARE/TDL concept of depreciation of the human capital for two main reasons: first, the wages to be paid are treated as expenses diminishing the profit of the financial capital. Second, the “human capital” is an asset (to be depreciated) made of rearing, non-human intangibles and education costs equally valued in the context of the labour market.

²⁰ This idea of treating the costs of women and men as depreciation costs was anticipated by Kapp (1950) and Perroux (1952), then repeated by Passet (2000). But these forerunners did not integrate it into a system of business and national accounts (see Richard, 2012, 2015c).

²¹ It is a common place to recognize that the concept of stockholders is so large that it cannot be very helpful in defining a true new type of business co-management.

conceived by Freeman in 1984 (for more details, see Richard, 2015b). Tradition dictates that in order to build a company, one must combine three types of capitals: labor, nature and machinery. In a sense, this new situation is a logical transposition of this tradition. Even disregarding matters of profit and firms' governance, the CARE/TDL philosophy will also have profound consequences for determining and interpreting some basic concepts of national accounting, notably the concept of added value, which we will discuss in the second part of the paper.

(To be continued)

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