

# IC, THE ACHILLES HEEL OF ACCOUNTING AND MACROECONOMICS.

Robert Boyer, James Perry

## Abstract

Measuring capital is a long standing theoretical challenge both for mainstream macroeconomics and accounting. The absence of a satisfactory solution dramatically obscures the understanding of the origins of growth and profit in contemporary economies. This article investigates the foundations of Total Factor Productivity and Goodwill measures from the point of view of theory, epistemology and methodology. Both measures suffer from the reference to a pure walrassian economy, the adoption of market efficiency hypothesis, the complete separability of factors and assets, the absence of any direct measure, a quasi- tautological methodology and finally they imply the inversion of the causality between capital, profit and growth. These common features hinder the intelligibility of the transformations that took place since the end of the Golden Age of Fordism. The concentration of capital gives an increasing market power to some dominant entities, competition implies more and more quality, product differentiation, servicing and quality. The surge of intangible investment (innovation, education, learning to learn..) drives a shift of productive paradigms towards a Knowledge Based Economy. Liberalization has entitled financial firms to capture a larger part of the profit without significant productive investment. Globalization allows a new transnational value chain that allows them to convert more easily IC into profit, given the declining bargaining power of workers at the world level. Actually, accounting at the micro level, economics at the macro misrepresent the source of firms and nations performances and the gap is increasing as capitalisms are entering a new epoch. In a sense, the age of innovation, financialization and globalization means a revenge of the Cambridge capital controversy: neoclassical economists won but they were wrong and now they are lost in the dark

# IC, THE ACHILLES HEEL OF ACCOUNTING AND MACROECONOMICS.

## 1. Introduction

A common belief among macroeconomists analysing the economic malaise of the early 2010s is that they are working with stronger theories and better data than their predecessors in the great depression of the 1930s. This article examines an important case which offers evidence to the contrary. We argue that *Intangible Capital* (IC), the “invisible factor of production”<sup>1</sup> at the core of today’s most promising growth sectors, is fundamentally misunderstood by macroeconomists and accountants.

IC is a phenomenon that neither macroeconomic theory nor accounting concepts were originally designed to accommodate. Nevertheless, scholars in both disciplines are attempting to fit it into their existing theoretical frameworks. Critically examining these attempts, we develop our argumentation in two parts as follows. First, there are two quite different concepts of capital that are common to both mainstream macroeconomics and accounting. Rather than fitting squarely into one of the two concepts, IC instead draws attention to the problematic contradictions between them, and potentially calls the broader framework of both disciplines into question. Second, IC is not a transitory phenomenon but an integral part of important structural changes taking place in the economy. It is tied to vertical disintegration, the growth of the “knowledge economy” and the global reorganisation of production. Moreover, understanding IC measurement is central to understanding feedback loops that are developing between accounting and the stock market.

In section two of the article, we characterise the two concepts of capital shared by mainstream economics and accounting ideas as *bottom-up* and *top-down*. In accounting, bottom-up refers to the traditional “historic cost” accounting paradigm and, more generally, to the calculation of a firm’s value from its component parts listed on the balance sheet. Top-down is the future-oriented modelling of the recent “fair value” accounting paradigm. In macroeconomics, bottom-up is implied when economists use a quantification of capital that is supposed to be independent of the profit rate (Mankiw). Conversely, top-down is part of any analysis where the capital measure is consciously derived from future profits (Hall 2001b).

IC, as currently addressed in accounting and economics, straddles both of these basic concepts of capital. The top-down approach is first used to initially assess the total amount of IC in a firm or in the wider macroeconomy (Lev, Hall) and then to value individual intangible assets (Accounting Horizons special issue). The bottom-up approach takes over when intangible assets are subsequently inserted either into a balance sheet framework to calculate firm value (Ibid), or a production function model to calculate economic growth.

As we explain in section three, mixing both concepts of capital like this implies a circular logic which invalidates some of the key practical and theoretical contributions that are claimed by accountants and macroeconomists. For example, accounting data is supposed to drive stock market investment decisions and hence aid efficient capital allocation; however, including top-down intangibles on accounting balance sheets achieves the inverse. This means stock market data is driving accounting data, and thus creating a self-referential loop. In macroeconomics, marginal productivity theory purports to explain the profit rate as a function of capital

<sup>1</sup> OECD 2006

productivity, but this clearly becomes circular if capital is itself conceptualised as a top-down compression of expected profits.

The remaining sections of the article build on the preceding analysis of accounting and macroeconomics, by linking the conceptual and theoretical issues of IC to structural changes in the contemporary international political economy. As we observe, the rise of IC – both numerically and in terms of the effort expended by economists and accountants trying to understand it – has occurred at the same time as two major shifts in economic structure: (a) The West, has started to de-industrialise by outsourcing production and reorganising its firms into vertically dis-integrated operations in contrast to the integrated firms of the Fordist era; (b) in contrast, South and East-Asia has industrialised extremely quickly, with many of the most profitable firms taking over the outsourced processes from the West.

In section four we place IC in the context of this change in the global organisation of production and argue that IC is not in fact a new form of capital, but rather the unravelling of an old form. We explain how tangible capital was only maintained as the main anchor of accumulation in industrial capitalism by virtue of producer-driven value chains comprising (relatively) vertically integrated firms. The accounting value of firms was only able to keep pace with corporate profits via a mechanism which routinely converted goodwill into tangible assets. The shift to producer-driven chains of vertically disintegrated firms a hundred years later has broken this mechanism, allowing value to accumulate in firms without being assimilated over time into tangible assets. We illustrate this in accounting detail with a stylised example of a Western manufacturer that outsources its production to focus on branding and product design. In this regard much of the post-industrial economy is not being built on a new intangible factor of production, but rather a reconfiguration of existing factors and changed bargaining power relations between their respective owners.

Section five places intangibles in the context of financialisation of the economy, arguing that intangible asset accounting and growth models create dangerous feedback mechanisms between the financial and non-financial sectors, increase the volatility and uncertainty of accumulation, and accentuate the fragility of the financial system as a whole. Section six summarizes a tentative framework for understanding capital, based on explicit recognition of the role of controlling scarcity, and bargaining with that control.

Section seven concludes by summarising our argument that the common failing of accountants and macroeconomists with respect to intangibles is the contradiction inherent to their definitions of capital. This contraction was somewhat concealed by the physical nature of tangible assets and was relatively benign before financialisation. However, in a financialised post-industrial economy it is both obvious in form and destabilising in nature. Although intangible assets, as a leading accounting scholar of intangibles puts it, are undoubtedly “the hallmark of modern economies and business enterprises” (Lev et al 2009:275) they could also prove to be the death knell of balance sheet accounting and conventional macroeconomic theory.

## 2. The elusive search for goodwill: the unsolved problem of IC valuation

### 2.1. Accounting

The need to improve accounting for intangible assets began to occupy economic policymakers in both the EU and US in the late 1990s due to a growing discrepancy between the market and accounting valuations of firms (Brookings Institution 2001). According to leading analyses by economists and accounting scholars at that time, the discrepancy was growing because accountants were failing to measure the vast majority of intangible assets, thus excluding them from corporate balance sheets (Lev & Zarowin 1999, Hall 2001).

To correct the failure, the OECD and European Commission have funded a series of international research projects in order to improve intangibles measurement (EC 2000, 2002, 2003a, 2003b; OECD 1999, 2006a, 2006b, 2012). The projects are carried out by academic researchers from the newly emergent field of IC accounting (ICA) which, over the following decade, established itself as sub-discipline of accounting with its own indexed journals and international conferences. An extensive survey of ICA literature, applying formalized content analysis to 2600 journal articles published on intangibles accounting between 2000 and 2009<sup>2</sup>, claims that ICA can now be classified as a “mature” research field (Guthrie, Ricceri and Dumay 2012: 78) because the focus of publications has shifted away from theoretical arguments in favour of empirical applications of a broadly accepted conceptual framework (ibid: 77).

The ICA conceptual framework can be said to address two key questions: How to *classify* IC, and how to *value* IC. In terms of classification, a basic taxonomy divides IC into three categories:

- *Human* capital is “the knowledge, skills, experiences and abilities of people” (EC 2002:10); it is what leaves a firm when its employees go home.
- *Structural* capital is “the knowledge that stays within the firm at the end of the working day” (EC 2002:11). It is comprised of organizational routines, procedures, systems, cultures and suchlike. Structural capital may reside in computer databases and administrative systems, as well as models, designs and concepts.
- *Relational* capital comprises “all resources linked to the external relationships of the firm, with customers, suppliers or partners” (EC 2002:11). Examples of relational capital offered by Meritum were image, customer loyalty, links with suppliers, commercial power, and negotiating capacity.

<sup>2</sup> Guthrie et al (2012) perform qualitative content analysis on 2662 journal articles from 2000-2009, in both general accounting journals and specialist intangibles accounting journals.

Although the labels given to these three categories above vary from study to study, their definitions remain consistent (Guthrie, Ricceri and Dumay 2012:70), and indeed closely match those of the European Commission's seminal *Meritum* project (EC 2002)<sup>3</sup>.

In terms of valuation, accountants predominantly employ the “bottom-up” approach, whereby the value of an item is derived from the sum of its component parts. As such, the accounting value of a firm is the sum of its net assets. The alternative “top-down” approach used in financial modelling and much economic theory (Varian 1996; Brealey and Meyers 2003) takes the opposite approach. Rather than being traceable to input costs, value is instead seen as a function of the future income streams expected to accrue to the owner of an asset. The top-down value of a firm is the sum of the firm's expected future profits, adjusted for the time value of money and risk.

The diagram below illustrates the contrast between bottom-up and top-down valuations of capital at three levels of aggregation (asset, firm, economy):

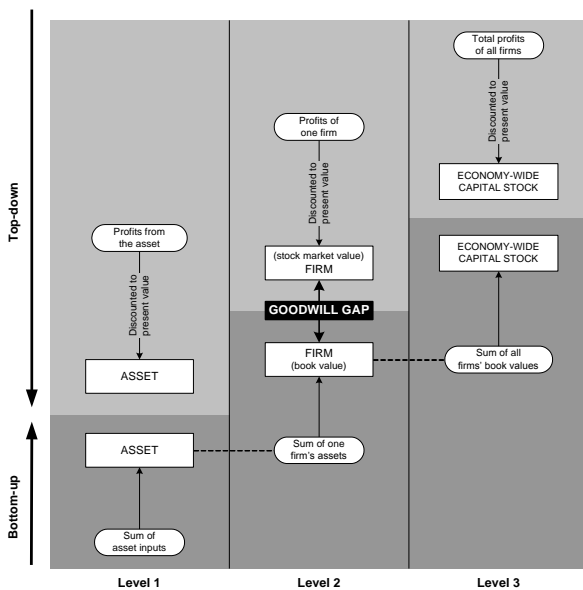


Figure 1. Goodwill and levels of valuation

<sup>3</sup> It should be noted that Meritum in turn drew heavily on earlier work by Edvinsson and Malone (1997), Stewart (1997), Sveiby (1997), Brooking (1997) and Bontis (1998).

As indicated above, the gap between the stock market's top-down valuation of a firm, and accountants' bottom-up evaluation of the same firm is called *goodwill*. The founding proposition of IC accounting was that the goodwill gap represents the unrecorded intangible assets that are "missing" from firms' accounting statements (Edvinsson and Malone 1997; Stewart 1997; Sveiby 1997; Bontis 1998; Lev and Zarowin 1999). This logic behind this proposition is that, if there was perfect and complete accounting information, and if prices tended towards their competitive levels, then book value and market value would coincide in the long-run. The assumption that the difference between firm's market value and book value can be accounted for by missing intangible assets is also written explicitly into the "editorial objectives" of the leading peer-reviewed journal in IC accounting (JOIC 2013)<sup>4</sup>. The goodwill gap, which economists refer to as "Tobin's Q"<sup>5</sup>, has grown significantly over the past three decades, as the following graph shows:

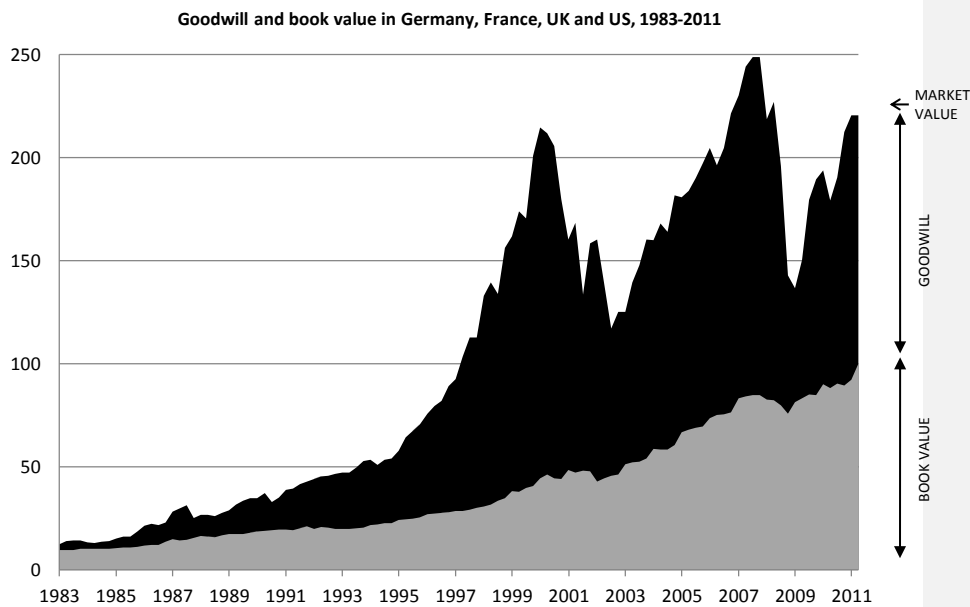


Figure 2: Relative goodwill and book value from 1983 to 2011 (indexed at 2011 book value = 100; totals for all listed non-financial corporations in France, Germany, the UK, and US; compiled using quarterly accounting and exchange-rate data from Thomson-Reuters)

<sup>4</sup> It should be noted that ... a relatively large number methods have been proposed since the mid-1990s, many of them tailored to specific companies or sectors; a 2012 OECD report on intangibles tangible accounting catalogues thirty-nine such methods, for example (OECD 2012a: 25-28)

<sup>5</sup> Defined as the ratio of the market value of firms to the replacement costs of their assets (Tobin 19xx).

Notwithstanding the considerable efforts of intangibles accounting researchers over the past decade and a half, global accounting standards<sup>6</sup> are still written in such a way that prevents almost all intangible assets from being listed on corporate accounting statements. In practical terms, this exclusion arises because accounting standards use an asset's historic cost as the dominant basis for measurement<sup>7</sup>. Historic cost accounting works for tangible assets which are generally purchased by the firm from external suppliers, but it does not enable the recording of intangibles which are typically generated internally within a firm. This situation persists despite the fact that firms in advanced OECD economies invest more in intangible assets than in traditional assets such as machinery, equipment and buildings (OECD 2010<sup>8</sup>:4). Essentially, as many IC accounting scholars have observed, historic cost accounting is regarded as "useless" with regard to intangibles (Edvinsson 2013: 166). The OECD regularly reminds governments that the void in accounting represented by goodwill hinders the efficient allocation of resources (OECD 2008, 2011). Similar frustration with this inability to measure intangible assets can also be heard among many senior executives of large corporations:

"The large discrepancies between the "book" and "market" values of many, if not most, public companies similarly provide strong evidence of the limited usefulness of statements of assets and liabilities that are based on historical costs. Clearly, a range of "intangibles" that are not well measured, or not measured at all, under current accounting conventions are driving company performance." (CEO\_Vision\_intangibles2006.pdf)

In summary, IC accounting scholars have developed a taxonomy for IC which comprises human capital (HC), structural capital (SC), and relational capital (RC). In common with OECD economists and private sector managers, IC scholars depart from the assumption that the approximate value of this unmeasured capital is the difference between the bottom-up accounting value (book value – BV) of a firm and its top-down valuation by the stock market (market value – MV). The following equation captures this set of ideas:

$$HC + SC + RC = IC = MV - BV$$

## 2.2. Macroeconomics

It is not only accountants who are interested in defining and measuring IC: macroeconomists and innovation and growth theorists have similar concerns. Their main inspiration is related to Joseph Schumpeter classification's that distinguish product and process development, organisational change, management, marketing, and finance (Schumpeter, 1934). Nevertheless, there is a significant variety of precise definition but a series of statistical analysis starting from the US

<sup>6</sup> This article refers to accounting standards issued by the Financial Accounting Standards Board (FASB) whose standards are used in the United States of America, and those issued by the International Accounting Standards Board (IASB), which are used by listed companies in all other major economies, including every EU member state.

<sup>7</sup> Add note acknowledging FVA development, but stressing that this is limited to financial assets such as stocks, shares, bonds and other financial securities.

<sup>8</sup> Interim findings document 2010

(Corrado, Hulten, and Sichel, 2009) have been extended to Europe (Van Ark, Hao, Corrado and Hulten, 2009), using the same taxonomy of the component of IC:

- *Computerized information*, well captured by the national accounts as computer software both purchased and home made. This category also includes databases that generally are not included in national accounts.
- *Innovative property* includes scientific and non-scientific RD. These IC will be taken into account by the 2008 system of national accounts implemented in 2013. The non-scientific RD is quite difficult to capture since it aggregates the costs of development of new motion pictures, investment in new design, the spending of new financial product development. According to some estimates for the US in the late 1990, non-scientific RD as large as scientific RD (Corrado & al., 2009).
- *Economic competencies* are composed of brand equity and firm specific competencies. Advertising spending is partially considered as investment in brand. Investment in firm specific capital and human resources include the cost of employer provided worker training and an estimate of management time and expenditure on external consultant aiming at enhancing the productivity of the firm. The related statistical sources are very diverse and clearly the numbers are imprecise but their merits are to provide an explicit measure than can be used for international comparisons.

There is a significant overlapping between the components of IC put forward respectively from the firm point of view and from a macroeconomic approach. Both take into account the new paradigm based on information and try to capture by the investment in software and databases. Similarly, private accountants and macroeconomists recognise the crude approximations that are necessary to get a first cut estimate of IC. Basically, their common objective is to get a more accurate picture of the drivers of firm performance and national economies competitiveness.

Nevertheless, there are significant differences. On one side, relational capital seems crucial for the understanding of the firm position on markets, whereas at the macroeconomic level, the recent research has followed a typical Neo-Schumpeterian approach based on the IC built via RD, patenting, copyright, new financial products. On the other side, national accounts experience some difficulties in getting access to the most relevant forms of IC because they define the very core of firm specificity and sources of its performances.

### **In search for the sources of growth and stock market valuation**

The success of the concept of IC can be explained by the fact it helps in overcoming two of the major puzzles of modern economic theory:

- Recurrently, according to the many growth accounting exercises from the seminal analysis by E. Denison (1962) to the most recent ones, the evolution of labour and capital have proved to be unable to explain completely output growth. The related residual has commonly been attributed to technological change even if more cautious analysts have labelled it “the measure of our ignorance”. Should not IC be the missing factor of production? The strategy is the following: compare the residual without (equation 1) and with the inclusion of IC (equation 2) and expect that it is significantly reduced.



$$(1) \quad q = s_L \cdot \ell + s_K \cdot k + a$$

with  $q, \ell, k$  rate of growth of output, labour, tangible capital  
 $s_L, s_K$  respective weight of labour and capital  
 $a$  = residual / contribution of technical change, generally  $a > 0$

$$(2) \quad q = s_L \cdot \ell + s_K \cdot k + s_R \cdot r + b$$

with  $r$  rate of growth of IC  
 $s_R$  weight of IC  
 $b$  = new residual / contribution of technical change  
 with the hypothesis that  $b < a$  and possibly  $b$  is near 0

Generally, since IC grows faster than Tangible one, a larger fraction of growth is thus explained.

- A second puzzle relates to stock market valuation at the aggregate level and not only for individual listed companies. Basically, according to the very definition of the value of financial assets as the sum of discounted future cash-flow, in the absence of recurring shocks, the total valuation of a national stock market should coincide with its book value. Long term series for the US contradict this stylized fact. Especially since the 90s, the stock market has increased much more than implied by the rate of return of its tangible capital. It is tempting to attribute to IC this discrepancy. By definition, many authors, for instance Hall (2001), equate the value of IC to this gap:

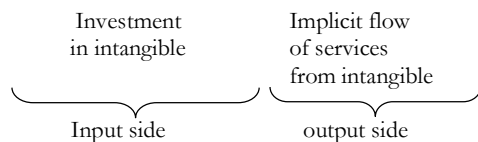
$$(3) \quad \text{National IC} = \text{Stock market value} - \text{value of tangible capital}$$

- Let us point out a twin analogy. On one side, the national IC is no more than the aggregation of the firms individual IC and this explains the strict homology between equation 1 and 4. On the other side, a second homology prevails between IC as a residual and the contribution of technological change,  $a$ , to national growth i.e. between equation 1 and 2. This is a first justification for the title of this paper that aims to build a common understanding of private accounting and growth accounting.

### Some doubts about an evaluation of GDP taking into account the extra value created by IC

Some researchers propose a step forward the inclusion of IC (Corrado, Hulten and Sichel, 2009: 8): "The key of this extension is that the flow of new intangibles must be included both on the product side of the accounts and on the input/income side via the flow of services from the intangible stock (a point sometimes missed in the literature on R.D).

$$(4) \quad P^Q \cdot Q = P^C \cdot C + P^I \cdot J + P^N \cdot N = P^Y \cdot Y + P^N \cdot N$$



Consequently the growth accounting equation (3) has to include this extension of output

$$(5) \quad q = \frac{P^Y \cdot Y}{P^Q \cdot Q} \cdot d \ln Y + \frac{P^N \cdot N}{P^Q \cdot Q} \cdot d \ln N = s_L \cdot \ell + s_K \cdot k + s_R \cdot r + b$$

Growth of  
intangible service
Growth of  
IC

$$(6) \quad R = (1 - \delta) \cdot R + N \quad \text{Stock of IC}$$

$$(7) \quad r = d \ln R \quad \text{Evolution of IC}$$

Thus IC has now a dual impact upon the growth process: first as a factor of production, as a stock, second as contribution to output. This process is not unknown by national accountants when they complete the aggregate output for instance by taking into account the implicit value of housing to their owners, even though non market transactions are involved. In that case, a justification could be that National Accounts try to trace the welfare for households and not only value created by firms. But there is a cost to this extension: effective transactions and virtual evaluations by an expert are mixed into a single measure. This weakness is still more detrimental for the intelligibility of output including the implicit services deriving from IC: the firms can only get a return from these services by selling typical goods on markets. IC might help to their marketing but indirectly as the outcome of past investment. Such a double counting, clearly exhibited by equation (5), is detrimental to the coherence of these extensions of national accounts. Furthermore, the “formidable measurement challenge” (of IC) (Van Ark and Al., 2009: 66) casts serious doubts over the relevance of such a mixing of actual transactions with fragile experts’ estimates.

More generally, the intangibility of some components of the competitive advantage of firms does not imply to invent intangible output. Is not the objective of IC to foster their market positions, and their ability to sell at profitable prices the final referee? There is only one argument in favour of such a revision of National Accounts: if the traders and financial investors decide to base their evaluation of stock market value on the intensity of investment in IC. This could introduce the equivalent of a (possible) self-fulfilling prophecy: financiers focus upon IC and conversely firms base their decisions upon the value of their shares. Nevertheless, let us note a dramatic asymmetry of information: the managers have a lot of degrees of freedom in declaring some of their expenditures as of IC. Hence the possible emergence of speculative bubbles, emerging out of the promises by managers of high rates of return from alleged breakthrough innovations (for more developments see section 6).

A last and important limit of the approach by macroeconomists is precisely that national accounts do not collect (and probably have no access to) the basic information for most components of IC. Thus they have to assemble quite heterogeneous data bases and apply quite ad hoc procedures to convert the various items into an aggregate valuation of IC (Figure 3).

Table 1. Intangible Capital Asset Types	
Asset type	Included in National Accounts?
<i>Computerized information</i>	
1. Software	Yes
2. Databases	? <sup>1</sup>
<i>Innovative property</i>	
3. Mineral exploration	Yes
4. R&D (scientific)	Satellite for some <sup>2</sup>
5. Entertainment and artistic originals	EU-yes, US-no <sup>3</sup>
6. New product/systems in financial services	No
7. Design and other new product/systems	No
<i>Economic competencies</i>	
8. Brand equity	
a. Advertising	No
b. Market research	No
9. Firm-specific resources	
a. Employer-provided training	No
b. Organizational structure	No

1. SNA 1993 recommended capitalizing computerized databases.

2. R&D satellite accounts are available, or under preparation many countries. Results for Finland, Netherlands, United Kingdom, and the United States are publically available.

3. The US BEA plans to include entertainment and artistic originals and R&D as investment in headline GDP in a revision in 2013

Figure 3. Source: Corrado Carol, Haskel Jonathan, Jona-Lassimo Julia, and Massimiliano Lommi (2012) IC an growth in advanced economies: Measurement Methods and Comparative results.

Highly fragile conceptual bases and quite shaky statistical evaluations make the whole project problematic.

### 3. Inherent and unavoidable tensions between top-down and bottom-up approaches to capital.

Seen from the bottom-up perspective, capital becomes objectified; each individual asset is treated as something that has its own *independent* and measurable quantity. This objectification is helped by the Historic Cost Accounting (HCA) paradigm which records assets on the balance sheet at the purchase cost of the item to which the asset relates. Thereafter the purchase cost effectively

becomes a quantity, and such quantities are added together so it becomes possible to talk about an economy-wide capital “stock”.

From the top-down perspective capital is not presented as an independent object but quite the opposite: Capital instead becomes *dependent* upon certain social relations. This is because top-down value is calculated on the basis of future net cash-flows, which are uncertain and require predictions to be made about future input costs and output prices. Such predictions in turn incorporate assumptions, explicitly or implicitly, about the firm’s future bargaining relations with other connected entities, such as suppliers, competitors, customers, and workers. If these relations change, then so does the top-down value of the firm’s capital. For example, if the firm’s workers form a union or its suppliers merge then its relative bargaining position is weakened, input costs will likely rise and *ceteris paribus* the top-down value of the firm’s capital will fall<sup>9</sup>.

With respect to intangible assets, as explained in the previous section, the working assumption of accountants and economists is that there is a new category of IC that has been missed. The cause of this is that labour costs have been mistakenly recorded as a current expense, when instead they should have been capitalised as an intangible asset. The left hand side of the equation below expresses this “mistake” from the bottom-up perspective; the right hand side is the corresponding top-down rationalisation:

$$(8) \quad \sum_{i=1}^{i=1+\theta} w_{t-i} \cdot \ell_{t-i} (1+\rho)^{t-i} = R_t = \sum_{i=t+1}^{j=t+\varphi} \frac{E_t(CF_{t+i})}{(1+\rho)_{t+i}}$$

Backward looking approach	Value of IC	Forward looking
Historical cost		expectation on future cash-flows
Past.....	Present.....	.....Future

$w_{t-i}$	wage and labour content of past investment
$\rho$	Long term interest rate, along a steady state growth
$CF_{t+i}$	<b>Net</b> Cash-flow associated to the investment
$E_t$	Expectations at period t
$\theta$	Maturation on period of investment
$\varphi$	Expected life of investment

This elementary equation enlightens the basic dilemma at the core of any measure of capital. It takes time to assemble capital in a firm and sufficient future cash-flows generated by past investment are expected to justify this undertaking. Consequently, past, present and future periods are involved and this introduces a structural tension in the valuation of capital, the intangible asset labelled “R”.

- From the bottom-up perspective, accounting at historical costs defines the “volume” of resources invested, here past labour during the period of formation of the IC. The evaluation

<sup>9</sup> One of the core aims of a firm is thus to optimally position itself relative to a wide array of complex relationships that each impact the future profitability, and hence the net present value, of its capital.

appears rigorous since it is based upon past transactions and is coherent with long established accounting practice. Eventually, the book value can be re-valued by a second measure of  $R$  at reproduction costs in order to adjust for inflation, obsolescence and technical change affecting the cost of the precise items of the IC.

- On the other side, the value of capital remains a guess about the future returns: expectations have to be built and they are based upon the predictions of future social relations that are made at time  $t$ . It will be revised from period to period, and generate losses or gains with respect to the initial estimate of  $R$  at period  $t$ . This standard microeconomic approach assumes – implicitly – a smooth trajectory of the firm, according to which expectations are basically fulfilled – i.e. the hypothesis of Rational Expectations (RE) – within a steady growth path of the economy that entitles to use a stable discounting factor in the aggregation of the flow of cash-flows for the entire life of the investment in IC.

The actual coincidence of the two valuations is a priori exceptional: errors of forecasting of the firm, macroeconomic shocks affecting the long run interest rate, impact of entry of new competitors are adding up to cause either losses or gains in capital. Capitalist economies never converge towards the full equilibrium “à la Marshall” where net profits are eroded, as panel data recurrently show. The related long run steady state is the foundation of the valuation of capital as noticed by Veblen (1908) in response to Clark (1891; 1901), at the very start of marginal theory of distribution. This has been given a rigorous proof by Von Neumann’s growth model (1945) that can be analysed as a formalisation compatible with both classical and neoclassical approaches (Kurz and Salvadori, 1993). Ironically, the fact that any capital measure involves quite drastic hypotheses about the time profile of the economy is recognised by the both sides of the Cambridge Capital Controversy: Joan Robinson (1956)....as well as Robert Solow (1963) when he declares that the issue is not so much about capital heterogeneity but “that of time, how do past, present and future interact?”

This caveat is especially important for IC. All its components display considerable uncertainty. For example, there is no competitive mechanism that ensures the rate of return on research and development, for instance, will converge towards “the normal rate”: most innovation projects fail and destroy capital and only a few deliver the exceptional profit associated with oligopolistic rents. In both cases, the evaluations by formula (9) at time  $t$  are ex post dramatically wrong – proving to be either radical overestimates or underestimates.

Variability of observed outcomes versus theoretical model does not in and of itself invalidate a theory, although its usefulness might well be called into question. However, besides variability there are two basic contradictions within the IC concept that are connected to the marginal productivity theory at the core of contemporary neoclassical economic thinking. These contradictions stem from the fact that IC valuation methods seek to combine bottom-up and top-down approaches to capital. As detailed in section 2, IC accounting uses top-down as a guide to how much total IC is missing, before attempting to fill it in using bottom-up techniques. Meanwhile, macroeconomists combine top-down and bottom-up because they assume the residual between them is IC.

### 3.1. Marginal productivity theory requires capital to be logically prior to profit.

The use of top-down valuations of capital, which explicitly incorporate assumptions about the profit rate, is highly problematic for the marginal productivity theory of income distribution (MPT). MPT purports to legitimise market-based resource allocation on efficiency and fairness grounds, and hence is a central pillar of mainstream macroeconomics and a legitimising idea from

Neoliberalism. This theory explains, at the most abstract level, how economic factors of production (labour and capital) are rewarded (wages and profits) in *proportion* to their respective contributions to production (Mankiw: 20XX: 47-56). MPT thus supports the neoliberal claim that competitive, frictionless, markets are by default efficient and just. A central claim of MPT is that the marginal productivity of capital is a key determinant of the profit rate.

Essentially, the marginal productivity of capital must be made to appear as if it can exist prior to the profit rate. Looking back at formula (9), this is simply not the case. Both an Austrian approach to the theory of capital as past expenditure in building equipment (left hand side of the equation) and a modern microeconomic theory as present value of expected returns of the investment (right hand side of the equation) imply a relation between the “normal”, society wide, rate of return of capital and the value of capital, in money term.  $R_t$  is defined by its value not its volume, because both backward and forward valuations are expressed in monetary terms. The strategy of neoclassical empirical research is then to look for a price index representative of composition of capital: either on the side of the sector producing the related equipment or services (Corrado & al., 2009; Van Ark & al., 2009) or on the side of stock market valuation (Hall, 2001a; 2001b).

$$(9) \quad \text{“Volume of IC”} \quad \overline{R_t^i} = \frac{R_t^i}{p_R} \quad \begin{array}{l} \text{Value as equation (8)} \\ \text{Statistical evaluation} \end{array}$$

For each component  $i \in [1, n]$

This reasoning at the micro level is another path for supporting the UK Cambridge view of the measure of capital and rate of profit are interdependent at the macroeconomic level. The reply of US Cambridge economists is that  $\rho$  is endogenously determined by the marginal productivity of aggregate capital

$$(10) \quad AR_t = \sum_{i=1}^{i=N} \overline{R_t^i}$$

Assuming the existence of purely technological production function.

$$(11) \quad \rho = F'_{AR}(L, K, AR)$$

Three objections have been addressed to this elegant and quite convenient approach, still dominant in contemporary economies.

- Let us first imagine an economy where a single good – the equivalent of corn for an agricultural economy – is simultaneously a production and consumption goods. The investment is here the corn saved from one period to another and used to seed and get a new crop the next period. The capital is here easily measured in terms of weight of corn, so is the output. The rate of profit is measured as:

$$(12) \quad \rho = \frac{\text{netcrop}}{\text{seeds} - 1}$$

This formula seems devoid of any ambiguity but the simplicity of the arithmetic is hiding a complex web of social relations since the representative agent of this economy is simultaneously a capitalist, a landowner and possibly a worker. Actually, formula (12) defines the rate of surplus of the related economy i.e. the maximum profit rate that can be obtained given the state of this abstract agricultural technology. In a real economy, they coexist and in a sense cooperate, the profit of the capitalists is the outcome of the distribution of this surplus and this introduces many institutional and legal factors. What do contracts between rentiers, capitalists, farmers, and eventually salaried work force imply? Not necessarily the convergence towards a purely competitive remuneration of capital. Everything is up to the distribution of lands of different fertility, the degree of mobility of capital between agriculture and industry, the nature of the contracts between the owners and the farmers. As soon as these social relations are introduced, the link of profit with the marginal productivity of capital becomes more and more elusive. A last hidden hypothesis has to be pointed out: such a simple formula (13) basically supposes the homogeneity of production techniques: this dramatic shortcoming of marginalist theory about income distribution was finally recognised by Paul Samuelson and Franco Modigliani (1966) on the US side of the Cambridge controversy.

- A second series of objections relates to the impossibility to define the aggregate production function independently from income distribution. Paradoxically, both the modernisation of classical theory by Piero Sraffa (1960), and a rigorous derivation of a neoclassical production function when the choice of technique is endogenous (Champernowne, 1953) confirm that such a interdependence is inherent to any economy exhibiting a multiplicity of techniques and products. More generally, the very progress of General Equilibrium Theory has destroyed two of the basic intuitions of naïve neoclassical theory. First, when factor returns are measured at a disaggregated level, the marginal productivity of capital is not monotonously decreasing (Bliss, 1975). Second, the convergence towards a stable long term equilibrium is not any more fulfilled, unless quite restrictive hypotheses are imposed upon the complementarity of goods (Hahn, 1966). In a sense, the latest development of mathematical economics suggests that Cambridge UK was right against Cambridge US.
- A third objection points out that out of the potential techniques and capacities of production available, those compatible with a uniform profit rate are endogenously determined along with the steady growth path of the economy (Von Neumann, 1945). This is another confirmation of the results mentioned by the previous paragraph, but the parsimony of this modelling makes it compatible with a dynamic version of Piero Sraffa's model but as well with neoclassical growth theory, a quite rare achievement indeed (Kurz and Salvadori, 1993). Let A and B define respectively the input and output matrices, q the vector of activity, p the price vector,  $\alpha=1+g$  is the expansion factor where g is the growth rate,  $\beta=1+r$  is the interest factor where r is also the rate of profit. Equation (1) states that the input of a period cannot be larger than the output of the previous one, equation (2) expresses that net profit is nil, relation (3) tells that the price of goods in excess of supply is zero, and (4) that processes with extra costs will not be used. Of course, only positive activity and price levels are admissible (relation (5)).

$$\mathbf{q}^T \mathbf{B} \geq \alpha \mathbf{q}^T \mathbf{A}. \quad (1)$$

$$\mathbf{B} \mathbf{p} \leq \beta \mathbf{A} \mathbf{p}. \quad (2)$$

$$\mathbf{q}^T (\mathbf{B} - \alpha \mathbf{A}) \mathbf{p} = 0. \quad (3)$$

$$\mathbf{q}^T (\mathbf{B} - \beta \mathbf{A}) \mathbf{p} = 0. \quad (4)$$

$$\mathbf{q} \geq \mathbf{0} \text{ and } \mathbf{p} \geq \mathbf{0}. \quad (5)$$

Under the condition that every process requires as an input or produces as an output some positive amount of every good ( $\mathbf{A} + \mathbf{B}$  strictly positive), the model determines which processes will be operated, therefore the capital goods with a positive value, what price will sustain the economy and what will be the equilibrium interest rate. Furthermore it is proven that the rate of growth and the rate of profit are equal.

The model is so compact that it is rarely used but it has proven to be quite powerful. Basically it shows the endogeneity of all economic variables: prices, rate of profit, rate of interest, level of activities and thus the valuation of capital, i.e. the price of the input of the previous period. The only weakness of this approach is to hide the wage / profit conflict by considering labour as produced by the consumption of a basket of goods – i.e. part of matrix  $\mathbf{A}$  – but the model is so abstract that it can be used to show that if workers get an improvement of their standard of living, the equilibrium profit and growth rate will be affected. The nature of social relations matters in determining the profit rate, on top of productive capabilities.

The converging conclusion of these last two reasoning is rather simple: the US position in the Cambridge controversy has not resisted to the scrutiny of modern economic theorising. Clearly, the measure of capital and equilibrium profit rate is simultaneously determined.

### 3.2. Perfect Competition of Substitutable factors of production

Perfect competition and substitutable factors of production are at the heart of marginal productivity theory. They have been the guiding principle of the marginalist school since its emergence at the end of the 19<sup>th</sup> Century as an alternative to Marx's theory that attributes the origin of the capitalist profit to the exploitation of workers. John Bates Clark put it thus: "What a social class gets, under *natural law*, is what it contributes to the general output of industry" (1901 – our emphasis), which today still expresses the very essence of contemporary neoclassical theorising with an impressive list of hypotheses:

- a. The hypothesis of a significant *substitutability* between capital and labour is required. If on the contrary certain machinery and certain labour skills are complementary, income distribution must derive from another mechanism: market power, relative bargaining of power of capitalist and wage-earners, laws and institutions governing both product and labour.
- b. The macro analysis is supposed to be the strict equivalent of the micro level, where the firm optimises its profit by varying capital and labour. Unless all firms are identical, such a



*representative* firm cannot be used to make comparison of various equilibria: the representation agent is specific to each equilibrium (Kirman, 1992).

- c. The *perfect competition* hypothesis is presented as the equivalent of a “natural law”, i.e. the state towards which all economies are bound to converge, whatever the social context. The very foundations of old institutionalism (Veblen, 1908) and modern one (North, 1990) is to challenge this primacy of perfect competition.
- d. A quite specific theory of *social classes* is adopted: they are not collective entities defending common interests of their members – including by distorting or controlling market forces – but they are the servants of factors of production, hence submitted to a technological determinism that governs income distribution. Conversely, any other factor of production (knowledge, science,...) that gets a share of income is to be associated to the related class (Florida, 2002). This correspondence between social stratification and the productive organisation of a society is quite problematic indeed.
- e. Basically, the causality runs *unidirectionality*: from techniques to the economic sphere, without any possible feedback from income distribution struggles to the choice of techniques and the direction of innovation. The literature upon endogenous technical change provides some evidence about the importance of this feedback (Romer, 1994)
- f. Implicitly, the hypothesis about factor substitutability implies the equivalent of a *full utilisation of productive capacity*, given the malleability of capital from one product to another. If capacity utilisation varies, one determinant of income distribution may be the level of effective demand and its impact upon the mark-up applied to unit production costs. This is the core message of Keynes and his followers (Kaldor, 1955).

### 3.3. (Failed) Attempts to address the problem

Given the previous developments, this point is now straightforward. *De facto*, private accountants only deal with the value of capital in monetary terms. For instance, they try to assess what fraction of its initial value is transmitted to each product and how competition is affecting its obsolescence in addition to the loss of physical efficiency. There has been widespread agreement among many economists about the pecuniary nature of capital. Let us give only two examples, one century old. Bohn-Bawerk (1907), reading John Bates Clark, considers that for the emerging neoclassical theory, capital is “a quantum of value imputed in material goods...only value jelly”. Commenting the same author, Veblen (1908: 162) writes “In the business community, “capital” is a pecuniary concept of course, and is not definable in mechanical terms”.

Consequently, marginalist micro theory and growth accounting methodology face a major difficulty since they absolutely need to derive the remuneration of capital from its physical productivity. They thus have to build a price index in order to use formula (10, *supra*). However, this is not an easy task because within neoclassical theory, the volume of capital equipment can be measured by deflating its value by the historical production costs or by a price index adjusted for the improvement in quality from one period to another. The discrepancy between the two evaluations can be very large, when a rapid technical change is taking place. The emergence of the new Information and Communication Technologies during the 90s has demonstrated that differences in national methodologies concerning the price index of these ICT goods, either historical costs or the equivalent of hedonic prices including quality improvement, could explain a large fraction of the discrepancy between the US and Europe (Brynjolfsson and Hitt, 2003).

After all, at the firm level, the marginal productivity of capital could be measured in value terms: how many dollars does the firm earn if one dollar more is spent on investment? Such an escape is not admissible for assessing growth performance: the GDP is measured at constant price, labour in hours or volume of employment and therefore capital has to be measured in volume...in conformity with the vision of a mechanical process of production. From a theoretical standpoint, this is a minor point, but practically it casts major doubts about the legitimacy of considering the Denison's residual as an evaluation of technical change.

#### **3.4. Summary: The inherent tensions between top-down and bottom-up are highlighted, rather than concealed, by IC.**

How can capital simultaneously be in input *quantity* and the *price* of a claim to output? That the simultaneous use of both concepts creates a tautology in key economic models was even acknowledged by Nobel Prize-winning neo-classical economist Paul Samuelson, whose work strongly influenced the neo-liberal ideology at inception. After considering the problem at length, Samuelson conceded there was no unambiguous way of measuring capital except in an "ex post tautological sense" (Samuelson 1966:582)<sup>10</sup>. All the pitfalls mentioned for typical tangible capital are still more severe for intangible investment.

- a. Capital is futurity; each item of capital is a compression of (a vision of) the future. If any of the visions of the future exclude one another, then clearly it is a nonsense to add them together into a "stock". (Lachmann). Compounding this, the degree of *uncertainty* affecting intangible IC is very high indeed: will an ambitious RD programme deliver the expected return? Will the enormous spending for getting a blockbuster movie deliver the super profit generated by quite a few success stories? What is actually the rate of return of advertisement expenditures? Is the rate of return of a new financial product correlated with the volume of spending devoted for inventing it?
- b. The very concept of IC challenges the hypothesis of a *steady state of perfect competition*. Have not neo-Schumpeterian models shown that the very essence of innovation is to generate transitory but highly profitable oligopolistic rents? Where is the perfect market for managerial talents that would guarantee that high level managers are paid their marginal productivity? What about the idiosyncrasies and complementarities that generate the profit of most firms (Bebchuk, and Field, 2003).
- c. Practitioners of financial markets recognise that *assets* and therefore *capital* cannot be measured independently from the prevailing *discount rate*? For them, the conception of Veblen about the pecuniary nature of capital is much more relevant than John Bates Clark's vision of a quasi-physical or mechanical origin of profits.
- d. Given the *eclectic nature* of the sub-components of IC, the measure of price index and therefore the volume of capital becomes a daunting challenge: what does this aggregate mean given the heterogeneity of their average returns and respective volatility?

<sup>10</sup> The dates of Samuelson's quote might suggest otherwise, but this tautology was never resolved, only forgotten. See Cohen 200xx; c.f. Blaug 19xx

#### 4. Intangible Capital in the Reorganisation of Production

One of the reasons that the contradiction between top-down and bottom-up capital valuation has remained out of sight in most economic discourse is that the two approaches have hitherto been used for different sectors of the economy. Bottom-up is the realm of the “real” economy and theories of production; top-down is the realm of the “fictitious” economy and theories of finance. This split can also be directly evidenced in International Accounting Standards since historic-cost (bottom-up) is used for tangible assets of plant, property and machinery (IAS16), whereas fair-value accounting (top-down) was introduced especially to deal with financial assets (IAS39).

The distinction between real and fictitious capital is one of degree not one of different fundamental types; the former is a claim on production, the latter is a claim on that claim. Both real and fictitious assets are pecuniary; their price in a free market is driven by their expected future earning potential. Similarly, the difference between historic cost accounting and fair value accounting also tends to be overstated. A historic cost is merely a price from the past, a price which – at that point in time – reflected the *average* expected future earning potential of the asset. The difference between historic cost and fair value is thus the timing of expectations. It is not that only one of them is forward looking, they both are. Moreover, this timing difference is another reason why it makes no sense to add together assets valued at historic cost with those at fair value because, having been made at different times these predictions are likely to incorporate visions of the future that have mutually exclusive elements (Lachmann 195x). Indeed, since very few assets are priced simultaneously, and incorporating shared assumptions about the future, it is strictly speaking a fallacy to add many of them together at all.

Nevertheless, it remains to be explained why there is a sharply increasing “goodwill gap” between bottom-up and top down valuations of firms. This section of the article first offers a fresh analysis of this question, suggesting that goodwill has resulted from the contemporary reorganisation of the *ownership* of *existing* factors of production, and does not necessarily imply a new factor of so-called “intangibles” has been created. In view of this, section five then goes on to examine what happens when the fictitious financial economy is not tethered to past pecuniary values via the historic cost paradigm.

##### 4.1. The mechanics of intangibles – not a factor of production, but a new way to control scarcity

In a 1908 article in the Quarterly Journal of Economics, Veblen suggested there was a two-step process through which goodwill is first created and then subsequently transformed into tangible assets (1908:118-120). He illustrated this with the example of an advertising campaign deployed by a manufacturer to increase market share and profitability. A successful campaign would lead first to the creation of goodwill, and then later to the expansion of the firm’s tangible assets:

“The ulterior end of advertising is, it may be said, the sale of an increased quantity of the advertised articles, at an increased net gain; which would mean an increased value in the material items offered for sale; which in turn is the same as saying an increase of tangible

assets. It may be *assumed without debate that the end of business endeavor is a gain in the final terms of tangible values*. But this ulterior end is, in the case of advertising enterprise, to be gained only by the intermediate step of the production of an immaterial item of good-will, an intangible asset.” (Veblen 1908:119, my emphasis)

This century-old analysis incorporates an assumption, highlighted above in italics, which today looks quite odd: It states that the objective of a business endeavor is a gain in tangible values. For Veblen a “business endeavor” was one that sought differential commercial power through the accumulation of tangible assets, whose values derived not from their productive contributions, but from their owner’s ability to *sabotage* production by controlling access to industrial apparatus (see also Hunt 2004). Today, in contrast, being able to control production lines and industrial plant has to a great extent been subordinated to control of brands, patents, design, etc (cite Dicken book, but also OECD intang projects)

So Veblen’s assumption, that tangibles are chief carrier of value at the end-point in the accumulation process, no longer holds. However, his analysis could still be informative. If the correlation between commercial power and control of tangibles is not seen as a general truth (“without debate”) but instead as a historically specific characteristic of Veblen’s ‘industrial capitalism’, then his analysis in fact points to a simple explanation for why tangible asset values are insufficient in today’s ‘post-industrial capitalism’.

This can be done by considering Veblen’s two-stage process in accounting terms, following the rules of traditional historic cost accounting:

*Firm A* is a consumer goods manufacturer using tangible assets to make “normal” profits. To increase its profits above the “normal” rate, *Firm A* embarks on an advertising campaign. If this strategy is successful, *Firm A*’s new “super-profits” will be capitalized by the stock market, initially as goodwill. *Firm A* now has tangible assets (at historic cost) representing its “normal” profits, and goodwill representing its “super normal” profits.

*Firm B* supplies *Firm A*’s industrial machines. When these need replacing (or increasing in capacity), *Firm B* can seize the opportunity to raise the price it charges to *Firm A*. If *Firm B* has sufficient bargaining power, it can raise its price up to the point where *Firm A* is once again making only “normal” profits. Some (or indeed all) of *Firm A*’s immaterial goodwill is then replaced by increase in tangible capital on its balance sheet. Meanwhile, if everything else remains unchanged, *Firm B* ends up with an equivalent amount of goodwill because, like *Firm A* in the previous stage, *Firm B* now has raised its prices with no required increase in tangible assets:

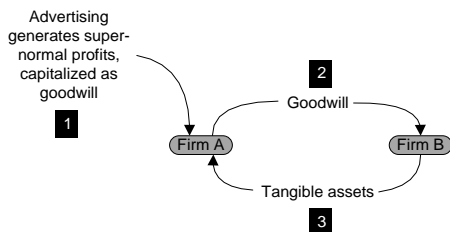


Figure 4. *Firm A*’s immaterial goodwill is converted into material tangible assets via *Firm B*

This cycle repeats backwards again along a value chain with Firm B's goodwill passing to Firm C, and so on.

If this was all that happened then the total amount of goodwill in the chain would inexorably build-up as the economy expanded over time [nb. gw is not just advertising!]: *Fresh* goodwill created at the start of a chain would be continuously dispersed to other firms in the chain according to the institutional power of each. Following the logic of cost-based accounting standards, the only thing that could prevent this inexorable build-up of goodwill would be if some firms in the chain were doing the opposite of Firm A, i.e. internally generating their own tangible assets instead of purchasing them. This would replace goodwill with tangible assets without passing it to another firm in the chain. This is the *only* way that immaterial goodwill can be *definitively* converted into a tangible asset rather than merely dispersed. Such internal generation of tangible assets takes place, for example, when a firm builds its own industrial plant, incurring costs that are capitalized directly into a tangible asset under traditional accounting standards (IASB 2006c). See Firm D, below:

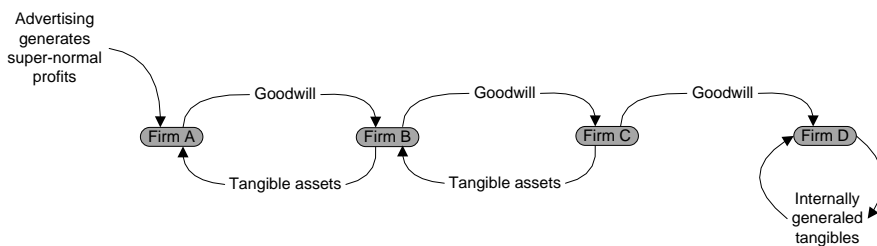


Figure 5. Immaterial value is passed back along the value chain as *intermediate* goodwill until it can be converted definitively into tangible assets by a firm that is generating them internally.

Such sources of corporate wealth always appeared first as immaterial goodwill and were only later incorporated into the price of tangible capital. This ongoing conversion has created the intricate economic reality of tangible asset values in industrial capitalism. However, for it to continue working, two conditions must be met:

1. Firms that are generating fresh goodwill (Firm A in the above example) must have tangible assets that need replacing from time to time.
2. The industrial production of tangible assets must carry more institutional power than the generation of goodwill (otherwise the goodwill would not get dispersed to Firm D in the above example).

In Veblen's time, the prevailing political-economic configuration met both these conditions: *Industry* was where the power was; this was *industrial capitalism*.

The conversion mechanism outlined above is not conjecture, but simply a logical reading of the basic rules of historic cost accounting. How else could the economy's tangible capital stock possibly have kept up with the level of profits?

If this definitive conversion of immaterial to material values were to become blocked, goodwill would mushroom out of control and the economy would begin to lose its main anchor to tangibility. That is precisely what is happening today. The demise of a capitalism rooted in tangible industrial assets is marked by the failure to meet conditions (i) and (ii) above. This does not point to a technological shift as a sufficient explanation for the ascent of “post-industrial capitalism” or the “knowledge economy”. Instead it points to a particular rearrangement of power in value chains, which in turn requires a specific *political* application of technology – not merely technology by itself<sup>11</sup>. In the time the goodwill gap has grown, that political application has comprised export-oriented national development strategies in “emerging Asia”, liberalized international capital and goods markets (especially in the OECD), and advances in information and communication technologies such as the internet, computer aided coordination of manufacturing and design, and containerized shipping (Levinson 2006). Taken together, these changes have resulted in the breaking-up of vertically integrated firms, that characterized the so-called “Fordist” mode of accumulation (Aglietta 1979), into disintegrated parts which can be relocated across international borders without undermining the functional integration of production (Feenstra 1998).

This process is now widely referred to as the *offshoring* or *global outsourcing* of production, in which business activity has come to rely on internationally highly disaggregated and geographically dispersed value chains (Gereffi et al, 2005; Mudambi, 2007); and yet a continued centralization of certain functions (including R&D, marketing and finance), as well as control over subsidiary management and decision making.

Rather than analyze international trade as a set of inter-firm, market-driven transactions coordinated by the price mechanism, global value chain analysts have shown how certain *lead-firms* directly or indirectly create systems of governance linking together a whole chain of firms “in a variety of sourcing and contracting arrangements” (Gereffi, Humphrey and Sturgeon 2001: 1). These systems of governance set the conditions under which firms from emerging economies can access international markets. Lead-firms are those exercising greatest control over the resources required to join a value chain. In the buyer-driven value chains that characterize vertically disintegrated, outsourced production, a key resource is profitable access to consumer markets (Kaplinsky 2005: 104-106). Such lead-firms do not actually *own* their consumers but, as a result of immaterial processes such as marketing and branding, they own a key lever of power in the chain between consumers and producers. As Gereffi et al put it:

Lead-firms are predominantly located in developed countries and include not only multinational manufacturers, but also large retailers and brand-name firms. They play a significant role in specifying what is to be produced, how, and by whom. (Gereffi et al 2001: 1)

Nevertheless, global value chain research emphasizes how value chain governance is rarely, if ever, dominated by one firm. Furthermore, an important role is also played by non-firm actors such as the International Standards Organization, social-audit firms, and civil society advocates for labour rights (Merk 2007). In short, what lead-firms have is institutional power: The *diffuse interactive* power of one actor to exercise greater control than others over the institutional arrangements governing their terms of interaction (Barnett and Duvall 2005). As Barnett and

<sup>11</sup> Indeed, it is doubtful whether technology can ever be considered apolitical (see LaTour 1988).

Duvall emphasize, institutional power relations involve “specific resource-laden actors” but the arrangement always has some degree of independence from any single one, otherwise it would fall into the category of compulsory power (Ibid: 51). Only because lead-firms are able to accumulate sufficient institutional power, through their control of immaterial processes, can they increase profits by outsourcing material processes to cheaper locations, subsequently closing factories and laying-off industrial workers in home territories.

The inter-national, inter-firm separation of material from immaterial processes, combined with the accumulation of institutional power by firms engaged in the latter, is obstructing the immaterial to material wealth conversion originally observed by Veblen. In the passage quoted at the start of this section, Veblen referred to the processes that create immaterial goodwill as *intermediate*. This is no longer the case: Immaterial value is now captured by firms that have sufficient institutional power to retain most of it, and that have often dispensed with most of their tangible assets. The assimilation of immaterial into material wealth has therefore been slowed to a crawl, and goodwill is not intermediate any more. Rather, the asset of “goodwill” is the end-stage in the contemporary accumulation process.

To see what this means in firm-level accounting terms, we next present a stylised example. Firm X is a manufacturer in a rich OECD county. It combines machines and labour to produce manufactured outputs which are subsequently sold. The conventional accounting model of firm X comes in two parts: The balance sheet records *stocks* of resources remaining at the end of the year; the income statement records *flows* of resources that took place during the year. To keep the illustration straightforward it is assumed that the share capital invested by X’s shareholders covered exactly the cost of its production machinery, i.e. the firm has zero debt. This simplification reduces the complexity of the analysis, but does not change the outcome.

Firm X’s year-end balance sheet and income statement look like this:

<b>Balance Sheet</b> (stocks of resources)	<b>Assets</b> Machines	<b>Liabilities</b> Debt (none)
<b>Income Statement</b> (flows of resources)	<b>Income</b> Sales	<b>Expenses</b> Wages, Raw materials

Figure 6

If the markets in which firm X operates are perfectly competitive, then the following can be said about the magnitudes of each of the items above.

- a) The purchase cost of X’s machines was the present-day value of the future net income streams expected from owning them (at the prevailing ‘normal’ profit rate). With no debt, X’s book value is simply the cost of its machines.

Balance sheet:  $\text{Cost of machines} = \text{Book value}$

- b) X is competing with other similar firms, producing comparable products. It also faces the same input markets for labour and raw material markets as they do. As such, X's profit rate is competed down to the same level as its competitors, i.e. a rate which it is *just* sufficient to persuade shareholders to maintain their investment. This is what is meant by the 'normal' profit rate (Mankiw 2007:42; Bromwich 2004:36).

*Income statement:*       $Sales - (Wages + Raw\ materials) = \text{'Normal' profits}$

In perfect competition, with complete markets and perfect (accounting) information, everything fits together: The value of the 'normal' profits on the income statement, when summed together for future years, and discounted back to a present-day value, is equal to the book value of the firm.

In short, the book value of the firm is the present value of its future income statements. Moreover, this book value would also be equal to X's stock market value because a perfectly competitive stock market would correctly price the firm's shares at the present value of its future profit dividends. There would thus be no goodwill gap.

The above example is, admittedly, simple in the extreme. But its purpose is merely to illustrate the idealised situation if markets worked according to the requisite economic axioms, and if accounting was fully accurate and transparent. This sets the scene for explaining why the conditions of "post-industrial capitalism" now put accounting standard setters in such an impossible position; the problem they face is quite fundamental since it challenges some of their key axioms – namely the need to distinguish stocks from flows; a stock is merely a capitalised expectation of flows.

Extending the example into post-industrial capitalism, suppose firm X now develops an outsourcing relationship with an overseas contract-manufacturer who can offer semi-finished products at a lower cost than X was producing them. Firm X then scraps some of its machinery and dismisses some of its workers. The remaining production workers finish off the products to maintain their previous high qualities; other workers manage customer and supplier relationships, branding and design. The products are sold for the same price as before.

The most obvious impact of this change is that firm X is now making profits at a super-normal rate because its absolute profits are higher, while its capital base is reduced. This is because sales income remains unchanged, expenses are lower (the outsourced production costs less than the dismissed workers and raw materials used to), and the scrapped machines have reduced the firm's book value.

As a result of its new outsourcing relationship, a "goodwill gap" opens up between firm X's reduced book value and its market value, the latter having actually *grown* due to the increase in profitability. In order to close this goodwill gap, firm X's accountants would have to recognise the new outsourcing relationship as intangible accounting assets – i.e. some combination of structural capital, relational capital and human capital, as per the Meritum taxonomy. Indeed, if this were done, and the new intangible assets were equal in size to the present value of firm X's



increased profitability, its goodwill gap would be closed completely and its profit rate would become 'normal' again.

According to accountants, growth economists and regulators, post-industrial capitalism has created a new set of "invisible factors of production" which are difficult to measure (OECD 2006). However, as the above analysis suggests, an alternative explanation is that the goodwill problem arises because post-industrial capitalism has created a *new* kind of asset, but because it has substantially disrupted an *old* mechanism, identified by Veblen, which routinely converted immaterial value into material value.

There is presently no sign of a replacement for the authoritative combination of physical definition, legal definition, and focus of pecuniary value that was embodied by the idea of the industrial asset. To the extent that one might eventually emerge from "measurement" efforts, it is difficult to see how such a replacement could be a sufficiently robust ideational anchor around which to organize and legitimize the social relations of production and distribution (section 3). Making intangible assets appear in a bottom-up sense from goodwill was easier in the hubris of the pre-crisis boom years, but nevertheless remains an imperative of contemporary capitalist accounting: It is an accounting idea embedded in a historically specific set of international socio-economic processes; accountants and economists are trying to superimpose ideas from industrial capitalism in a post-industrial setting that no longer serves to conceal the purely pecuniary nature of capital. Moreover, because ICA makes no attempt to distinguish production from power, the intangible asset values it generates are highly unlikely to take us any closer to the efficient allocation of resources which regulators claim to be aiming for in their mission statements.

#### **4.2. A widening gap between an inadequate theorizing and accumulated structural transformations of contemporary capitalisms.**

The previous analysis of some key mechanisms in contemporary economies calls for an historical retrospective about the emergence of the concepts of service economy, post industrial society and the related rise in the role of immaterial or intangible capital.

##### **The shift from typical mass production to an oligopolistic competition along quality, product differentiation and innovation.**

The mix of material and immaterial capital, manual and intellectual work, is a constant feature of the history of capitalism, but of course their respective proportions have significantly varied in the long run. A survey of productive paradigms suggests the succession of various stages, with a decreasing explanatory power of a mechanical approach of capital. Let us give some evidences about this historical transformation.

- The long run changes in the car industry give a first sketch of this general trend. After the founding period by talented craft-men, the Ford T-model opens the era of mass production of highly standardized goods. Nevertheless this lack of differentiation is self defeating and creates an opportunity for an alternative productive paradigm based upon a larger final product differentiation out of still standardized components: this was the invention of the

General Motor strategy. Marketing and branding become key elements in profit formation. The contemporary phase is associated with a trans-nationalisation of this model, by the systematic exploitation of national difference about what makes a car valuable (Freyssenet & al., 1998). Basically, the rise of marketing costs and consumers surplus extraction is replacing the pure increasing returns to scale. This trend is still stronger in this early 21<sup>st</sup> century (Freyssenet, 2009) (figure 7).

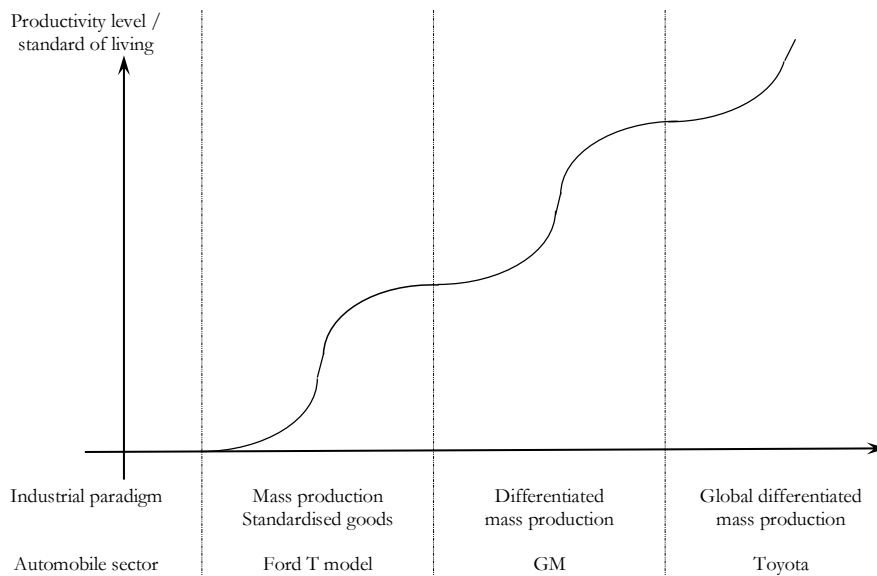


Figure 7 – From standardized goods mass-production to the oligopolistic / monopolistic rents for contemporary capitalism

- Intangible capital is at the core of the goodwill implicit to the stock market valuation of the world brands. Do the Coca-cola extra-profits come from a superiority in engineering and distribution techniques? Clearly, the patient construction of the image of this beverage has been crucial in the success among a quite overcrowded sector. Similarly, both Dell and Apple computers are manufactured with an equivalent technical efficiency but the mark-up is quite different since the first has conceived its role as a mass-manufacturer, whereas the second is selling a life style ideal. The fashion industry is still another example of branding and image building as a source of dramatic differentiation in the rates of returns of invested capital. In all these cases, the process of material transformations of input into output is present but it is not the core of performance differentiation. By the way, productivity increases are no more the benchmark that stock markets take into account in their respective valuation of competitive firms: the pecuniary aspect of capital – i.e. the ability to produce profit from one period to another – is leading over a purely technical measure of technical efficiency. Do portfolio managers estimate production functions? Not at all! And this makes the whole neoclassical approach quasi-totally irrelevant for the understanding of modern capitalism.

- The seminal growth accounting international comparisons tried to explain relative national performances by the intensity of productive capital, assimilated to material infrastructures and processing equipments. This factor still captures a part of these international differences, when one compares for instance the US and Chinese growth. Nevertheless, the ability to build, keep and expand their specialization in sectors where national producers are essentially price-maker and not price-taker has become a crucial factor in national trajectory divergence. For instance, the French economy is still specialized in low value added / low skill segments whereas the German counterpart has developed high value added / high competences within the very same sectors (Freyssenet, 2012). Consequently, facing the same exchange rate Euro / Dollar, the French manufacturing sector has been shrinking, the German one expanding. A long time ago, some macroeconomic studies had detected that this was implying diverging trajectory within the same European monetary system (Aglietta, Orlean, Oudiz, 1980).

Thus, for business studies and macroeconomic analyses, the production function approach seems to be less and less relevant even within the manufacturing sector. What about if a possible paradigm shift is underway?

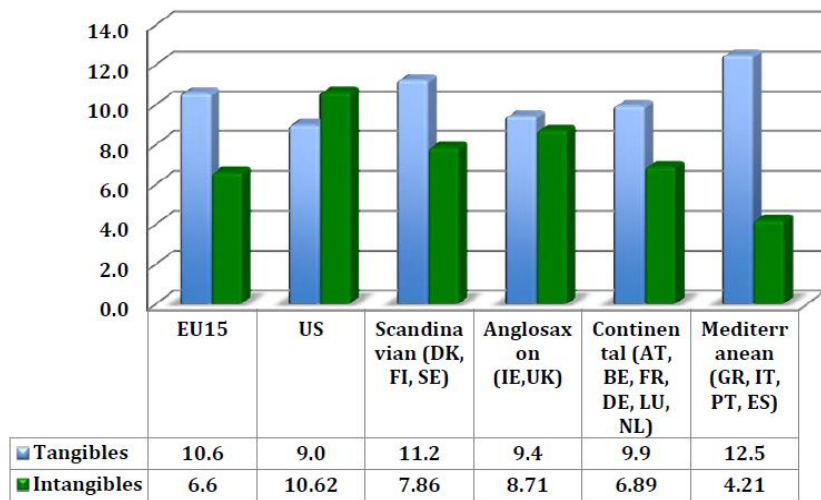
#### **4.3. ICT and Knowledge Based Economies are no more built upon typical productive investment but upon immaterial and relational capital**

The diffusion of ICT has popularized the hypothesis of an epochal change: the value of each good or service would be set more and more according to the intellectual and cognitive content required to be successful on international markets. But these technologies would only be the mechanical / electronical side of a more conceptual revolution: many sectors are now created out of an intensive view of scientific advances, as evidenced by biomedical contemporary research. For some analysts, this change is captured by the concept of Knowledge Based Economy (KBE) (OECD, 1996) whereas other technical change specialists point out the importance of the acquisition of competences by learning by doing, by communicating, by exchanging and they prefer the concept of Learning Economy (LE) (Lundvall and al., 2007).

Both approaches have the same consequences: intangible capital is overcoming material and mechanical capital formation: this statement is roughly confirmed but the transformation is quite unequal across continents and nations. The US and Scandinavian countries are leaders in the exploration and implementation of this emerging socioeconomic paradigm (figure 2).

Figure 8 – Tangible vs intangible GDP shares: 1995-2009

(Average value)



Source: Corrado et al. (2012)

Within the same region, for example the European Union, the advance of KBE/IE can be quite unequal: relatively developed in UK and France, but quite lagging in Italy and Spain (table 6). The so-called Mediterranean countries have therefore a quite different production paradigm than Northern Europe, and this is recognised as the underlying structural factors that made the Euro crisis of the 2010s so acute (Artus, 2012). Thus it would be erroneous to suppose that their relative productive efficiency is only linked to the intensity of tangible capital formation: not only have they different production factor mix but they do not explore the same technological frontier.

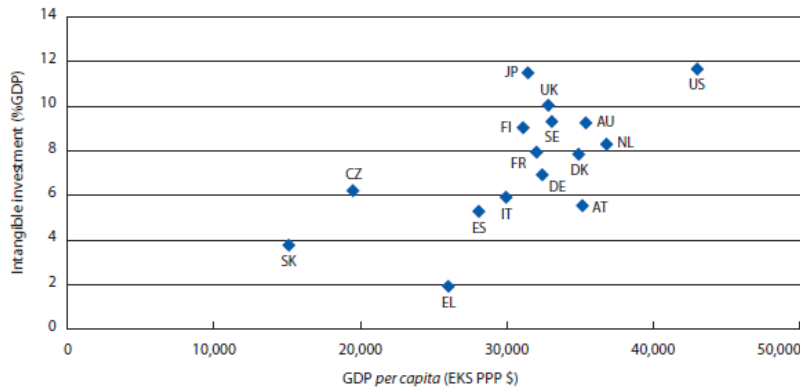
Figure 9 – Intangible investment in the market sector in Germany, France, Italy, Spain, UK and US (percent of GDP 2006)

Type of Investment	Germany	France	Italy	Spain	UK	US
	2006	2006	2006	2006	2006	2006
<b>1. Computerized information</b>	<b>0.73</b>	<b>1.42</b>	<b>0.64</b>	<b>0.79</b>	<b>1.55</b>	<b>1.61</b>
a) Software	0.71	1.37	0.63	0.76	0.00	
b) Databases	0.02	0.05	0.01	0.03	0.00	
<b>2. Innovative property</b>	<b>3.59</b>	<b>3.18</b>	<b>2.21</b>	<b>2.78</b>	<b>3.16</b>	<b>4.37</b>
a) R&D, including social sciences and humanities	1.72	1.30	0.58	0.63	1.07	} 2.25
b) Mineral exploration and evaluation	0.01	0.04	0.09	0.04	0.04	
c) Copyright and license costs	0.21	0.31	0.10	0.18	0.22	} 2.12
d) Development costs in financial industry	0.75	0.60	0.58	0.52	0.07	
e) New architectural and engineering designs	0.90	0.93	0.86	1.41	1.74	
<b>3. Economic competencies</b>	<b>2.84</b>	<b>3.30</b>	<b>2.19</b>	<b>1.90</b>	<b>5.84</b>	<b>5.50</b>
a) Brand equity	0.56	0.99	0.71	0.42	1.15	1.47
Advertising expenditure	0.41	0.73	0.47	0.19	0.91	
Market research	0.15	0.26	0.24	0.23	0.24	
b) Firm-specific human capital	1.29	1.51	1.02	0.81	2.54	} 4.03
Continuing vocational training	0.65	1.25	0.71	0.71		
Apprentice training	0.64	0.26	0.32	0.10		
c) Organizational structure	1.00	0.81	0.45	0.68	2.14	
Purchased	0.54	0.32	0.15	0.27	0.51	
Own account	0.46	0.49	0.3	0.41	1.63	
<b>Total Investment</b>	<b>7.16</b>	<b>7.90</b>	<b>5.04</b>	<b>5.47</b>	<b>10.54</b>	<b>11.48</b>
<i>pro memoria</i>						
<b>Total Spending</b>	<b>7.55</b>	<b>8.51</b>	<b>5.43</b>	<b>5.70</b>	<b>11.56</b>	

Source:

Suggested Citation: van Ark, Bart; Hao, Janet X.; Corrado, Carol; Hulten, Charles (2009) : Measuring intangible capital and its contribution to economic growth in Europe, EIB Papers, ISSN 0257-7755, Vol. 14, Iss. 1, pp. 62-93, <http://hdl.handle.net/10419/44905>

Sticking to this old conception launched by John Bates Clark and first formalized by Douglas thus generates a progressive loss of relevance of conventional theories: if lagging countries continue to build tangible capital and specialize in the simpler part of world value chains, the more advanced ones use intangible capital as a method for proposing new goods, processes and organisations that convert them from price takers to price makers. As economies become more sophisticated, the share of intangible capital over GDP tends to increase (figure 3).

Figure 10 – Intangible investment and GDP *per capita* (2001-04)

Source: *Idem*

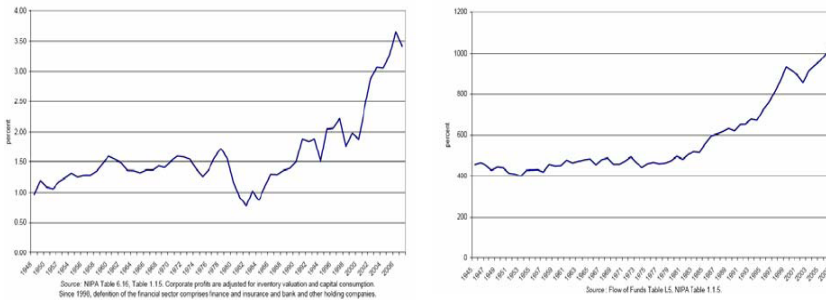
It would not be the first time when the innovation typical to the capitalist socioeconomic regime makes obsolete the analytical tools and statistical representations of the economy. Has not Adam Smith pin factory and division of labour replaced Quesnay's representation of the economic circuit of an agricultural based economy? Has not the principle of unfettered competition led to the formation of the oligopolies and monopolies, diagnosed both by Karl Marx and John-Maynard Keynes' contemporaries? Finally, since the mid-1980, has not the process of the financialization been overarching the productive and real side of the economies?

##### 5. The inability to rigorously measure intangible capital triggers high financial volatility and makes financial crisis more frequent and severe.

Traditionally, financial profits are analysed as the transitory form of the profits derived from using productive capital. But let us follow again Veblen's hint about the nature of capital as a right over value appropriation. In the US, the profits share of the financial system used to be small and nearly constant but with the full steam of liberalisation it has been increasing constantly from 1986 to 2008 and it was correlated with a boom in the ratio financial wealth / GDP (figure 4 A, B). Clearly, this was not obtained by a typical industrial strategy of curbing down labour costs but by an unprecedented cluster of financial innovations: credit default swap, asset based mortgage, derivatives and derivatives of derivatives and of course securitization. The creation of these new instruments was supposed to cover risks but actually some actors have use them to speculate and diffuse risk from one market to another until provoking the systemic crisis revealed by the collapse of Lehman Brothers. In retrospect, the contribution to real economy efficiency and citizen welfare is quite problematic indeed. Nevertheless, the actors of finance have kept their profits and benefited from the socialisation of the losses they generated. There is no better example of a complete disconnection between contribution to output and remuneration.

A – Profits appropriated by the financial sectors / GDP (1948-2007)

B – Total financial assets / GDP (1948-2007)



Source : CROTTY James and Gerald EPSTEIN (2008), "The costs and contradictions of the lender-of-last resort function in contemporary capitalism: the sub-prime crisis of 2007-2008", WP Political Economy Research Institute (PERI) University of Massachusetts, Amherst, May 2-3.

Figure 11 – Two indexes of the capture of profit and wealth by finance

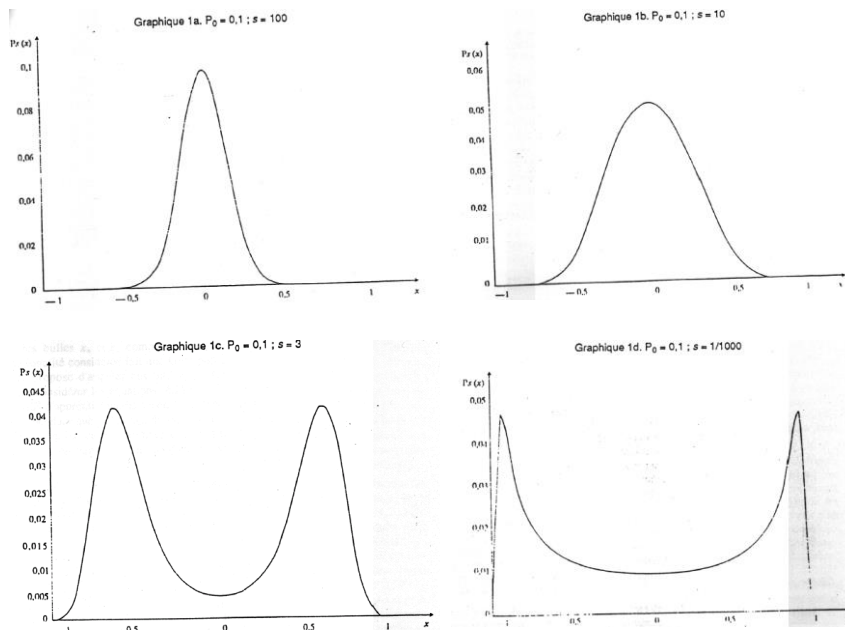
This was not the only trick to appropriate an increasing fraction of US profits. The financial sector had access to the Central Bank credit at a very low nominal interest rate and could use this competitive advantage to push the leverage effects in order to boost their return on equity (ROE) at the cost of macroeconomic financial stability. Similarly, the diffusion of stock options and golden parachutes has generated an equivalent dissymmetry between high rank manager and rank and file wage-earners (Boyer, 2010). Paradoxically, in case of bankruptcy these perks, bonuses, and related non wage remunerations were guaranteed by contract, whereas workers were dismissed and lost their income: the AIG collapse gives a suggestive example of the predatory nature of many segments of the financial system. Micro analyses of the work process and remuneration within banks have confirmed this divorce between the few traders that had their remuneration linked to the sales volume or the implicit profit earned and the other professionals or wage-earners paid according to the ongoing wage on the related labour market (Godechot, 2001). For instance, the statisticians and the physicists that invented the new complex financial instruments have not been remunerated according to the final contribution to the profit of the financial entity, wonderful example of the opposition between value generation and appropriation.

More generally, the uncertainty about the measure of IC and furthermore its likely return has another adverse impact: when the financial markets are the hierarchical institutional forms shaping the evolution of forms of competition and wage labour nexus, the whole macroeconomic regime experiences the consequences of financial fragility (Boyer, 2011).

### 5.1. Stock markets may deliver a fluctuation around “fundamental” values of financial assets only when the uncertainty is limited

A significant fraction of the theoretical literature (Keynes, 1936; Orléan, 1990; 2004; Shiller, 1999; 2000) shows that the conjunction of radical uncertainty and a large liquidity of financial market generates the succession of speculative bubbles that regularly burst out. In this context, when uncertainty increases traders tend to weigh the average market price more than their own private valuation. Initially, this feature only increases the variance of the market prices around the long term fundamental value. Nevertheless, up to some threshold in the imitative behaviour, the fundamental value is no more an attractor and the economy oscillates around two opposite values that express respectively over-pessimistic and over-optimistic views of the traders (figure 5).

Figure 12 – When uncertainty increases, stock market does not converge anymore towards fundamental value



Source: André Orléan (1990)

This quite robust pattern fits with the observation about the long term evolution of stock markets as soon as a potential radical innovation is perceived as a source of extra profits, the mimetic mechanism of following the market price independently from a personal valuation triggers bubbles that necessarily burst out. Therefore, the deep and liquid financial markets do not generally allocate efficiently capital according to the fundamental value of each investment project: it would be so for highly repetitive project involving minor risks easily assets in the light of past distribution of probabilities. As soon as some uncertainty prevails – i.e. no ex ante objective probability distribution is available for decision makers – financial markets recurrently oscillate between bears and bulls, what is to say over-optimism and their over-pessimism. This has been a recurring feature since the emergence of commercial and then industrial capitalisms.



### **5.2. Most of intangible investments are typically uncertain, much more than routine production via equipment goods.**

This feature is exacerbated in the contemporary world, because the conjunction of the key role of IC and the central role of financial markets makes this phenomenon stronger and more frequent. Remember the invention of sophisticated options that generate a booming activity for institutional investors: after the momentum created by this invention, the collapse of LTCM reminds the Nobel Prize winners that were its founders did not fully mastered the properties of these options. A similar pattern is observed in the energy sector: a company that used to produce, sell, and buy, electricity finds that selling derivatives about future electricity contracts is much more profitable; unfortunately the market of these features displayed the structural instability of most financial market contrary to the much more predictable demand of electricity (Boyer, 2013).

This is typical of financial innovation but most other components of intangible capital exhibit the same uncertainty (see table 1, supra). Will an oil exploration project succeed? Whatever the sophistication of geological expertise, no accurate forecast can be made *ex ante*. Hence, the permanent possibility of speculative bubble over finally non-existing gigantic reserves. While an electrical car replace the present combustion motors? The knowledge of physics are unable to deliver a clear diagnosis. Will the next movie of a well-known author become a blockbuster? No recipe is available to Hollywood tycoons. Can climate relate derivatives create a new and viable market? The jury is still out. Will the Chinese be able to construct brand image in order to get access to the segment of luxury cars? Experts disagree and such an heterogeneity of expectation might trigger a bubble. Will the manager of Pepsi-Cola succeed to an equivalent brand building for a car maker in crisis?

Actually, intangible capital has always been part of capitalist activities but IC overwhelming role brings new sources of financial and macroeconomic instabilities, and not only is it extending the conflicts in the appropriation of value created.

### **5.3. Intangible capital is largely driving stock market capitalisation that alternates large and lasting sub-estimations with over estimations**

Given the new features of contemporary capitalism, intangible capital is actually the investment required to possibly get innovations that would sustain future profitability of new goods, services, production processes and organisations. Since most accumulation regimes are innovation-led in mature capitalism, the financial community seems to take into account the stock of intangible capital in the evaluation of national wealth, or more precisely its relations with GDP (figure 6).

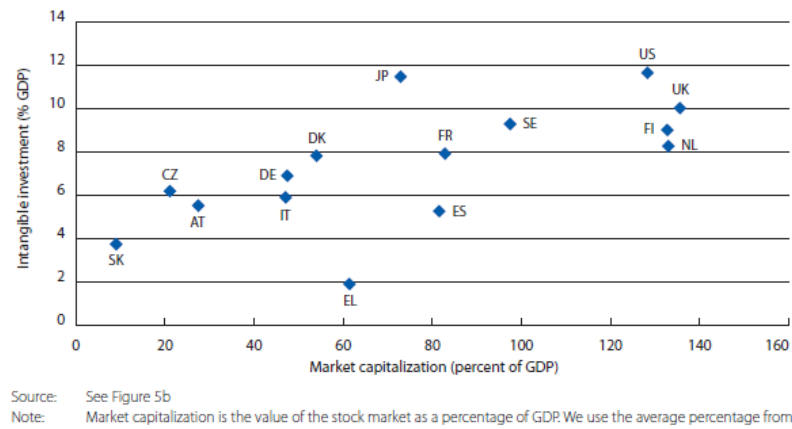


Figure 13 – Intangible investment and market capitalization (2001-04) *Source: Idem*

By the way, the balance between intangible and tangible capital (see figure 2, supra) seems to delineate a new economic geography at the world level. Even if the correlation is far from perfect this index go along with the degree of financial sophistication, conceived here as the shift from a bank centred system to direct finance. Of course, Germany seems to be a counter example but is not necessarily so: most of the competitive advantage of this country is embedded into the constant up-grade of equipment goods by learning by doing or by responding to new world demands.

Nevertheless the dominant actor in this alliance between innovators and financiers seems to be the later: has the financing of innovation out run other uses of credit? Not at all, since for instance security broker dealers have benefited from the explosion of credit, much more than non financial corporation (figure 7). Consequently, since the mid-80s two major bubbles have occurred and they had they destroy most of the previous valuation of intangible capital by the stock market. This is an alternative explanation compared with that of neoclassical theoreticians who stress the mere role of obsolescence of capital (Hall, 2001b). In the present analytical framework, this is consequence of an erroneous measure of IC, amplified by the structural instability of highly liquid financial markets.

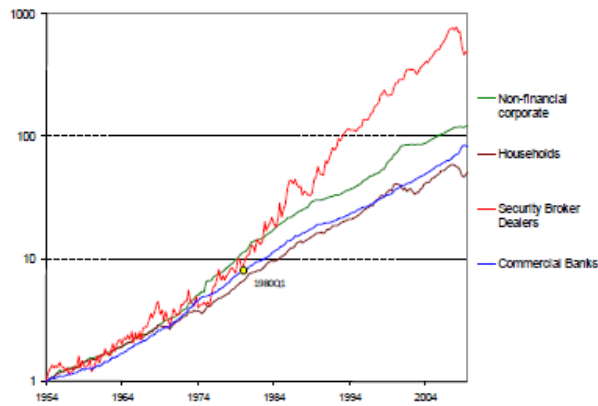


Figure 14 – Growth of Assets of Four Sectors in the United States (March 1954 = 1) (Log scale)  
(source: Federal Reserve, Flow of Funds, 1954-2009)

Source: Tobias Adrian, and Hyun Song Shin (2010), *The Changing Nature of Financial Intermediation and the Financial Crisis of 2007-2008*, Staff Report n° 439, Federal Reserve Bank of New York, March-April., p. 6

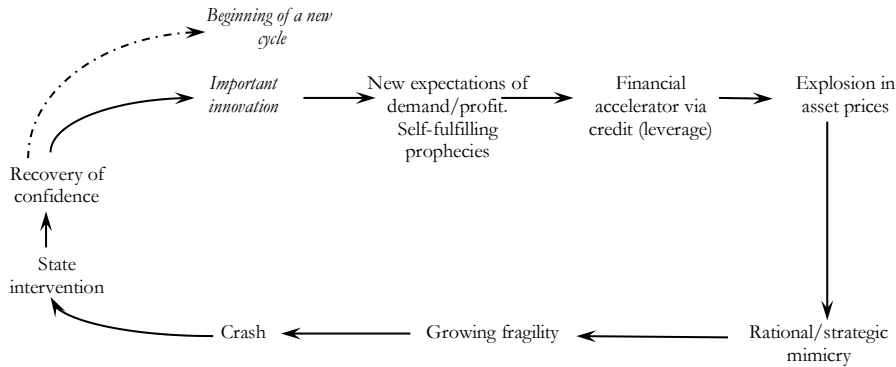
#### 5.4. The mystery of intangible capital and financial fragility seem largely correlated

Let us recall the previous hypothesis: IC is the vector of innovation and thus most of the teachings from economic history can be mobilised in order to interpret the ups and down in intangible capital formation. *Financial history* has the great merit of detecting the repetition of the *same sequence* of speculative boom-and-bust. Today there are numerous works on the subject: isolated to begin with (Kindleberger, 1978), they have multiplied with the rising frequency of crises since the mid-1980s (Eichengreen, 2003; Garber, 2000). What is new is that theorists of macroeconomics and finance have themselves drawn on the successive phases of speculative boom-and-bust in building models to explain the inefficiency of markets through more or less substantial modifications to either the hypothesis of rationality (Shiller, 2000) or the organisation of markets (Shleifer, 2002). It is remarkable that the same chain of events is repeated in every one of these episodes.

- They all start with an *impetus* related to an innovation, which may be technical (a new method for producing tulips, for example, or the invention of mass production methods), a new financial instrument (shares in a shipping company), the end of a conflict (the railroad boom after the American Civil War), the emergence of a customer base for new services (holidays in Florida through the purchase or renting of an apartment) or the possibilities offered by a new financial context (the flood of liquidities fuelling the rise in stock prices and the surge in take-overs, mergers and acquisitions).
- *Informed economic agents* adopt a selective strategy to ensure they can obtain the returns promised by the innovation. They carry out shrewd purchases, exploiting their technical expertise (how to grow these new tulips, what sort of real estate to build in Florida, etc.) or privileged information they possess, which is generally the case for financial innovations. Their behaviour is fully rational, and does not, in itself, create runaway speculation.

- But the strategy of these informed agents pushes up the prices of the products concerned and consequently of the financial assets of the companies involved in their production. And in response to these price signals, the market is entered by other agents who know little or nothing about the innovation, relying simply on an extrapolation of the price rises. Individuals who have never bought shares in their lives and have little idea of how they function transfer a significant proportion of their wealth into this financial instrument. During this third stage, *followers and credit* play a decisive role in inflating the speculative bubble. Their expectations are based solely on the surge in stock prices, independently of any evaluation concerning the reality of the profits or of the demand that might justify these stock prices. These followers adopt beliefs and prophecies more or less directly nurtured by the stock traders themselves. In modern language, “story-telling” has replaced the difficult if not impossible evaluation of fundamentals (Biondi, Giannoccolo and Galam, 2012).
- The boom is all the more powerful when an *authority confirms the reality of the promises* made to small savers and followers in general. In the Mississippi bubble, the French government officially supported Law. In the United States in the 1920s, an economist as renowned as Irving Fisher declared that the stock market boom and economic prosperity were made to last, a view that he maintained up until the very eve of the crash. In modern times, the turning-point in the Internet bubble came when Alan Greenspan, who had previously warned against “irrational exuberance”, rallied to the opinion of the markets, declaring that private agents know better than the central bank what level stock prices should be at.
- When this movement reaches its maximum, we are close to the moment of sudden reversal expressing the fact that the returns obtained are in fact well below those expected, whence the recurrent and almost structural temptation to manipulate the accounts and the *ex post* discovery of some spectacular frauds. Either because of the endogenous erosion of returns due to over-accumulation, or in reaction to some bad news, apparently fairly trivial but sufficient to trigger the readjustment of expectations. Another possibility is that the better-informed agents decide that, given the level reached by asset prices, it would be prudent to withdraw, by selling their assets.
- In the last stage in the sequence, the public authorities, faced with the gravity of the social and political consequences of the crash, are obliged to intervene, both to designate the culprits and to introduce rules and reforms to prevent the repetition of such episodes and restore the confidence without which the markets cannot function. In most cases, these measures are successful in getting people to forget the crisis, to such an extent that a new cycle can start: any innovation that catches the fancy is capable of setting off a new phase of expansion and then speculative boom (figure 8).

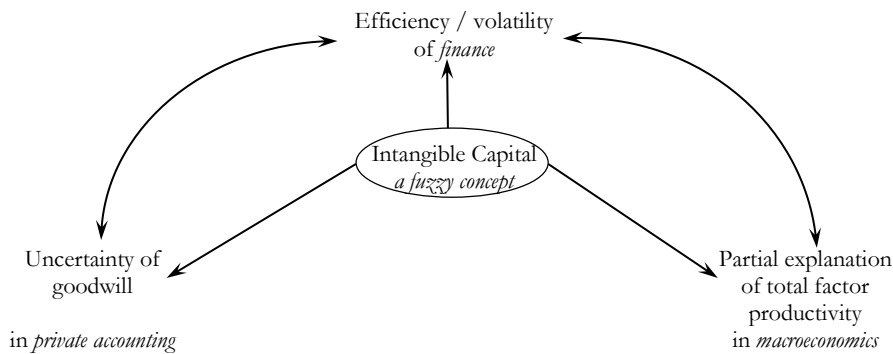
Figure 15 – From a reputedly major innovation to mimicry leading to financial fragility



The two most recent American bubbles have followed this pattern. The RD expenditures in the new economy start-ups have been forging an intangible capital that has proved far less efficient than expected by Silicon Valley experts: this is now a common interpretation about the internet bubble. The IC investment in new financial products such as the mixing of securitisation and ABM or complex derivative is the origin of the so-called subprime boom and crisis. Clearly, the issue of intangible capital, its intelligibility by actors and theorisation by experts are central to any understanding of contemporary American capitalism.

This is the logical conclusion of the previous analyses that point out a possible trilogy between the difficulties in measuring goodwill for private accountants, the inability of intangible capital to explain total factor productivity incorporating only tangible capital and finally the issue of efficiency/volatility of financial markets.

Figure 16 – Intangible capital, Achilles Heel of accounting, finance and macroeconomics

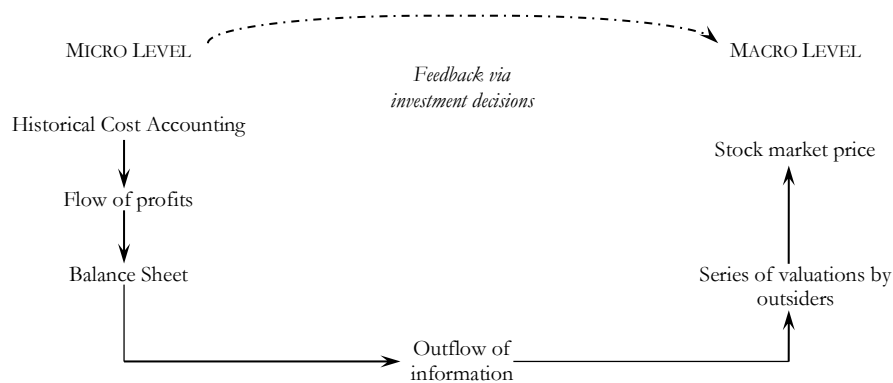


### 5.5. IASB accounting makes this volatility still more important

The built in instability of financial markets was partially contained during the Golden Age due to strict regulation curbing down the autonomy of financial entity in inventing and diffusing new instruments. Furthermore, the historical costs accounting principles usually gave an anchor for

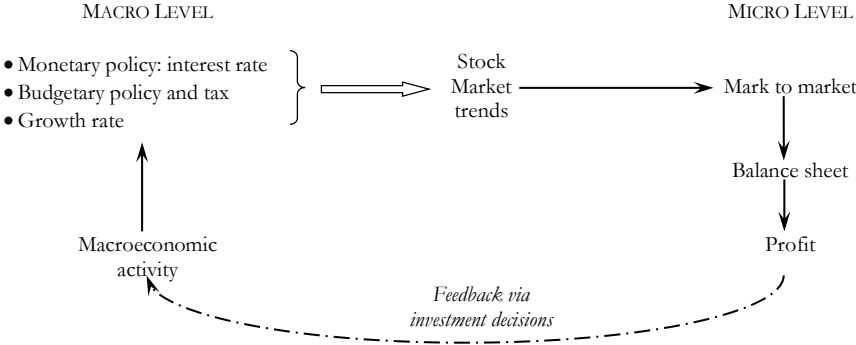
the evaluation by the stock market: the reporting of profit defined as the excess of value created over intermediate and labour costs was the basis for the formation of the expectation about future returns and the valuation of securities (figure 10). Nevertheless, the conventional accelerator model (Bernanke and *al.*, 1999) is explaining why the short termism of profit reporting was generating ups and down in stock markets, but of moderate amplitude and without any repetition of the 1929 stock market crash in the US.

Figure 17 – The stock market valuation as a consequence of historical cost accounting: the Golden Age



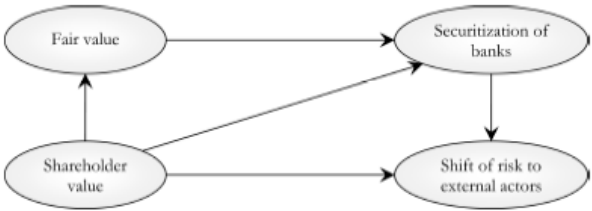
Financial deregulation, the clustering of new instruments and their diffusion at the world level open a new period of economic instability: basically, the real estate sector, bank credit and stock market bubbles tend to be synchronised and the reverberation of mimetic speculation from one domain to another pushes the finance-led growth regime into the zone of structural instability (Boyer, Dehove, Plihon, 2004). A last but significant factor has to be added: the shift towards IASB accounting system still brings another source of destabilisation: under the hypothesis of financial market efficiency, the value of the firm is set by the stock market once deduced the liability and this valuation is a priori independent of the flow of value creation (Boyer, 2007). Consequently, fictitious profits can be appropriated by CEO and CFO or distributed to shareholders (Boyer, 2010): there is no better example of the relevance of Veblen's conception of capital as an appropriation entitlement (figure 11).

Figure 18 – The stock market valuation as a the driver of individual performance with in IASB accounting principles



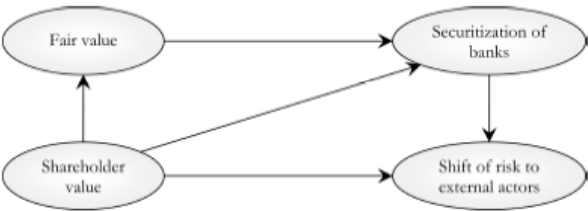
A related consequence is to exacerbate the financial instability and make more frequent major financial crashes (figure 12).

Figure 19 – The new accounting makes destabilizing reverberation effects more likely



Source: Boyer (2007)

Figure 20 – The new accounting makes destabilizing reverberation effects more likely



Source: Boyer (2007)

## 6. An alternative emerging paradigm

The previous sections have provided a critical assessment about the relevance of the present consensus upon the dealing with Intangible Capital: discrepancy between a residual with a substantive definition, adhocity of its subcomponents; weaknesses of the statistical indexes; irrationalism of the hypotheses legitimizing the most ambitious measures (perfection of markets, absence of structural uncertainty, marginal discrepancies around a long run steady state, incoherence of a measure of any capital independently from income distribution between profit and wage).

But simultaneously, the path for a more satisfactory approach has been, implicitly, explored. The related arguments can be assembled into a potential alternative paradigm (Figure 21).

Basically the concept of *scarcity* of a series of factors of production, largely substitutable, can usefully be replaced by that of *power*: some actors or some groups have the ability to directly or indirectly set the remuneration they extract from production processes that are largely the expression of cooperation between the complementarity of nominal, intellectual labour and idiosyncratic equipment. The concept of IC interprets as the expression of scarcity and “technical constraints” the remuneration of managers, symbolic analysts (à la Robert Reich), innovations, than de facto result from their position within contemporary chains. This reversal of neoclassical vision is largely substantiated by a new approach of the firm and its market power (Bebchuk, Fried, 2003).

Figure 21 – Understanding stock market and growth: two approaches

Paradigm Hypotheses	Approaches	
	Intangible Capital	Economic power and radical uncertainty
1. Core explaining factor	1.1. Scarcity of substitutable factors of production	<ul style="list-style-type: none"> <li>Power upon remuneration within de facto cooperation, hence complementarity</li> </ul>
2. Nature of the future	1.2. Risk (Existence of a probability distribution)	<ul style="list-style-type: none"> <li>Uncertainty (consequence of market relations and innovations)</li> </ul>
3. Nature of expectations	<ul style="list-style-type: none"> <li>Fully rational</li> </ul>	<ul style="list-style-type: none"> <li>Reflexive, context related, adaptative</li> </ul>
4. Core coordinating mechanisms	<ul style="list-style-type: none"> <li>Perfect markets (labour, capital, finance)</li> </ul>	<ul style="list-style-type: none"> <li>Imperfect markets embedded into social norms, organizations and institutions</li> </ul>
5. Nature of economic evolution	<ul style="list-style-type: none"> <li>Stochastic shocks on productivity</li> <li>Random walk on stock markets</li> </ul>	<ul style="list-style-type: none"> <li>Endogenous innovation and growth</li> <li>Momentum of optimism / pessimism and recurring bubbles</li> </ul>
6. Type of accounting	<ul style="list-style-type: none"> <li>Growth accounting at the national level</li> <li>Mark to market, mark to model: private accounting</li> </ul>	<ul style="list-style-type: none"> <li>Surplus method: interdependence creation / distribution</li> <li>Stick to actual transactions</li> </ul>
7. Nature of formalizations and models	<ul style="list-style-type: none"> <li>Neoclassical growth model with exogenous technical change</li> <li>Dynamic Stochastic General Equilibrium Models</li> </ul>	<ul style="list-style-type: none"> <li>Multiple heterogeneous agent models</li> <li>Evolutionary models of emergence of norms, techniques</li> </ul>



A second breakthrough relates to the implicit *concept of time*: a mere stochastic perturbation affecting a purely deterministic ratio of return of both tangible and intangible capital is the reassuring feature of conventional approaches. But this is a caricature of the (*radical*) *uncertainty* that is typical of most of the components of IC: will a new product find a market? Will a movie become a black buster? Is there a future for the mass production of electric cars? Will a new academic track deliver the expected returns? This makes quite problematic the idea of a managerial productivity as the determinant of the remuneration of the related talents and competences and this is especially challenging for private accounting methods that have to admit that a normal / market rate of return will prevail. If this expectation turns to be false, the value of IC has to be adjusted and may become negative in case of complete failure. This explains for instance the paradoxical negative IC observed when speculative bubbles burst out (Taylor, 2000) and graph *supra*.

If most of effective production organisations are built upon a form or another of *cooperation* among largely complementary factors, then the very concept of marginal productivity of any single factor cannot any more be defined. Consequently, the distribution of the surplus of value created – defined as the extra net production at constant prices – is a matter of *bargaining* power between producers and consumers, employees and employers, managers and stock-holders and other stake-holders such as subcontractors or local communities and State. The part of surplus captured the corporation will make possible its attribution to IC, the valuation, of which will derive from the positive rate of profit differential; computed upon tangible capital.

The *evolutionary models* which describe the interactions between multiplicity of heterogeneous firms suggest that the well behaved neoclassical aggregate production function is simply the emerging property of a series of selection / Learning processes among innovative or routine strategies (Dosi, 2005). What appears to the macro-econometricians as an *exogenous* trend for technical progress is actually the outcome of these complexes interactions, deriving from the *endogeneity of innovation* at the micro-level. The macroeconomic valuations of IC and total factor productivity are thus inverting the sense of causality between profit and marginal productivity that is typical of marginal productivity theory.

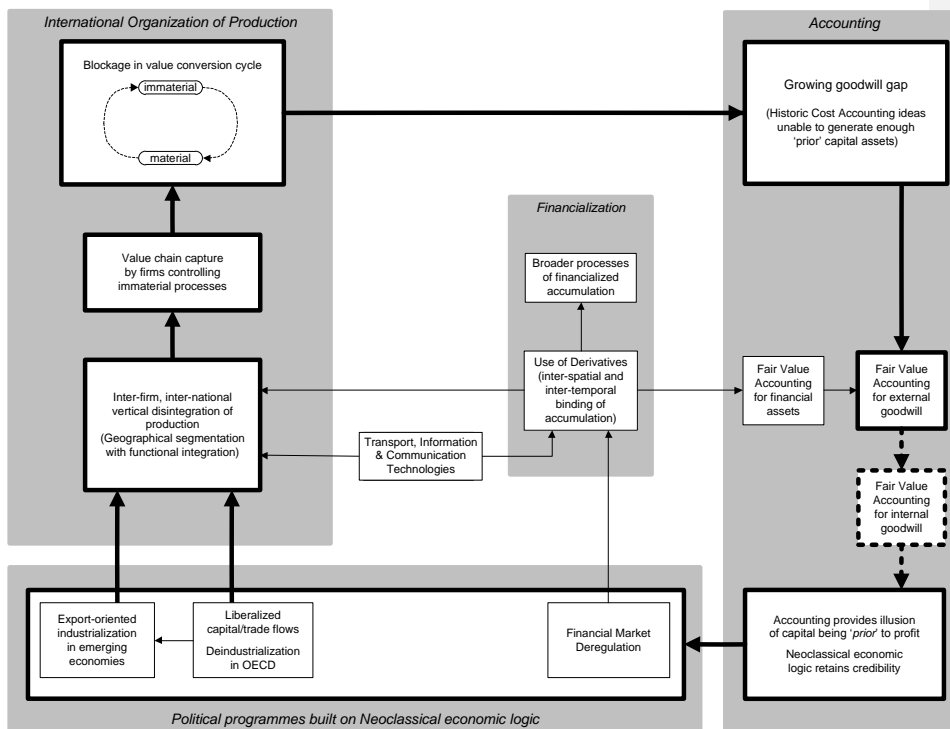
Last but not least, the contemporary boom in the ratio between Tangible and Intangible Capital reflects the shift towards a *new brand of capitalism*, where innovation, branding, servicing, story telling – Apple, Facebook – become much more important than manufacturing and efficient use of equipments. But the idea that the gap between market valuation and book value measures the productivity of IC, totally neglects that some innovations may trigger *speculative bubbles* that deliver an overly optimistic valuation of their contribution to production on a long term basis. What turn out to be an appropriation by shareholders and financiers is wrongly attributed to an improvement of the welfare for the economy.

To sum up, this economic power and radical uncertainty paradigm is a credible alternative to the dominant contemporary IC one.

## 7. Conclusion

The concept of intangible capital has emerged as a key explaining factor in a series of apparently disconnected domains in economics and business. For private accounting it helps in measuring the competitive advantage of a firm. For modern financial theory, it is the missing link between stock market valuation and historical costs of tangible capital. Last but not least, for macroeconomists, this entity is supposed to overcome the mystery of total factor productivity when measured according to labour and tangible capital only. The present paper explains how these three domains are connected and why in each of them the IC methodology has failed (figure 22).

Figure 22 – The argument of the paper in a nutshell (a): IC and neoclassical theory

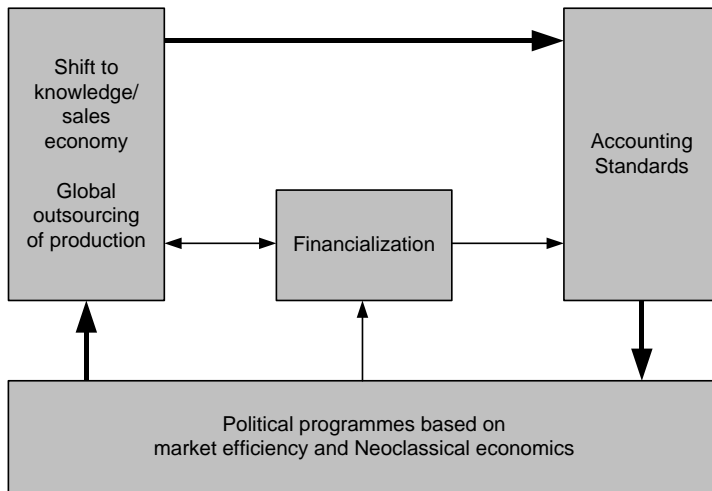


- a. First of all, intangible capital measuring runs into the same problems as encountered in the famous Cambridge versus Cambridge controversy about the explanatory power of an autonomous measure of capital concerning primary income distribution: inability to deal with uncertainty and the related errors in expectations, discrepancy between a backward and forward evaluation of capital, unsolved aggregation problems facing heterogeneity in production processes, joint determination of value of capital and profit rate. Clearly, modern mathematical economic theorising has abandoned the search for an aggregate

capital...but most neoclassical investigations and partial models do continue to use aggregate production functions, but it is a “coup de force” only legitimised by the inertia of tradition within neoclassical academic world.

- b. These crucial objections are still worse when intangible capital is taken into account. The unifying factor of the laundry like list of components (software, databases, mineral exploration, RD, artistic originals, new financial products, new design, brand equity, market research, managers' competences) is simple indeed: all of them are expenditures in order to invent and develop new products, services, processes and organisations. Given the radical uncertainty that prevails in most of these activities, the underlying hypothesis of capital valuation along a steady and rationally anticipated path, is never fulfilled. Furthermore, no market competitive mechanism entitles that the effective rate of returns of all the IC components are bound to converge. Consequently, conventional measures of IC are pure technical artefacts.
- c. This article argues that there is a common origin to the failure of private accountants to capture firms' goodwill, the tautological methodology of neoclassical theory of financial market efficiency and finally the failure of macroeconomists in their search for a full explanation of growth by incorporating the rapid growth of IC volume. It is the fuzziness and inadequacy of the concept of intangible capital and the flawed methodology to measure a badly defined notion.
- d. This conceptual debate between neoclassical economics and a wider socioeconomic approach is not new since it can be traced back to the lively debate between John Bates Clark and Thorsten Veblen in the early 19<sup>th</sup> century. The authors of this article are on the side of Veblen since the remuneration of capital is not the consequence of its mechanical and physical productivity but its ability to generate rights in the capture of value creation in the economy. Nevertheless, when capitalism shifts from a typically industrial regime based on mass production towards a constant differentiation of products built on oligopolistic competition and still more when it converges towards a financial innovation led growth, the erroneous conceptualisation and fallacious measurement of intangible capital make neoclassical whole theoretical construction totally irrelevant to analyse, interpret and monitor contemporary societies.
- e. The present evolutions, i.e. the recurrence of financial crisis and the strong differentiation of national trajectories, can be analysed as the outcome of the conjunction of three structural transformations. First, deregulation has triggered an unprecedented wave of financial innovations that have entitled financiers to capture a larger fraction of value. Second, globalization has drastically changed the cyclical transformation of intangible into tangible capital and generated a geographical polarisation between the zones where value is created and the regions where it is captured by pecuniary capital to use Thorsten Veblen's concept. The wage earners are structurally losing in this new configuration of the world economy and domination of finance over the real economy. Third, new accounting principles have legitimised and technically justified this new bargaining power of the so-called intangible capital (figure 16).

Figure 23 – The argument of the paper in a nutshell (b): IC and contemporary capitalism



- f. The rise of intangible capital is a significant and real feature of contemporary world but falsely analysed by neoclassical economists. Thus the authors conclude by proposing an alternative approach based upon an analysis of economic power in the presence of the radical uncertainty typical of market/capitalist economies. Furthermore, the so-called surplus methodology proves to be quite useful in disentangling the sources of value creation from its redistribution. Reflexivity should replace rational expectations hypothesis and the concept of equilibrium be abandoned in favour of evolutionary models with heterogeneous agents. Last but not least, within this framework business cycles and major financial crises are typical of a capitalism dominated by innovation.

Given the complexity of modern economies we need an aggiornamento of the dominant intellectual paradigms and paradoxically the controversy of the early 19<sup>th</sup> century is a stimulating starting point that can be enriched by all methodological advances observed since then.

## References

- Abramovitz Moses and Paul David (1973), "Reinterpreting economic growth: parables and realities", *AER*, Vol. 63 (2),
- Acemoglu Daron and Fabrizio Zilibotti (2001), "Productivity differences", *The Quarterly Journal of Economics*, Vol. 116, n° 2, May, p. 563-606.
- Aglietta Michel, Orlean André, Oudiz Gilles (1980), « Contraintes de change et régulations macroéconomiques nationales », *Recherches Economiques de Louvain*, Vol. 46, n° 3, Septembre, p. 175-206.

Archibald G. C. (1960), "Testing marginal productivity theory", *The Review of Economic Studies*, Vol. 27, n° 3, June, p. 210-213.

Artus Patrick (2012), « La zone Euro : l'erreur de conception et l'oubli de l'hétérogénéité structurelle, elle peut conduire à l'écèlement de l'Euro », *Flash Economie*, n° 288, 18 avril.

Bebchuk Lucian Ayre, Jessie M. Frieds (2003), "Executive compensation as an agency problem", Working Paper, Berkeley.

Bernanke, B. S., Gertler, M. and Gilchrist, S. (1999), "The Financial Accelerator in a Quantitative Business Cycle Framework", In Taylor, J. and Woodford, M. (eds) *Handbook of Macroeconomics*, vol 1C pp.111-156. See also Amsterdam, North Holland, NBER Working Paper 6455, March 1998, <http://www.princeton.edu/~bernanke/nber.htm>

Commenté [SL1]: PAGES?

Biewen Martin, Weiser Constantin (2011), A New Approach to Testing Marginal Productivity Theory, IZA DP n° 6113, November.

Biondi, Yuri, giannoccolo, Pierpaolo and Serge galam (2012), "Formation of Share Market Prices under Heterogeneous Beliefs and Common Knowledge," *Physica A: Statistical Mechanics and its Applications*, Volume 391, Issue 22, 15 November 2012, pp. 5532-5545.

Bliss Christopher J. (1975), *Capital Theory and the Distribution of Income*, Amsterdam and New York: Elsevier North-Holland.

Böhm-Bawerk, E. von (1907), "Capital and Interest Once More: II. A Relapse to the Productivity Theory", *Quarterly Journal of Economics*, February, 21:2, p. 247-82.

Boyer Robert (2007), "Assessing the impact of fair value upon financial crisis", *Socio Economic Review*, Vol. 5, n° 4, October, p. 779-807.

Boyer Robert (2010), "The rise of CEO pay and the contemporary social structure of accumulation", in the United States", in Terrence McDonough, Michael Reich, David M. Kotz, *Contemporary Capitalism and Its Crises: Social structure of accumulation theory for the 21<sup>st</sup> century*, Cambridge University Press, New York, 2010, p. 215-238.

Boyer Robert (2011), *Les financiers détruiront-ils le capitalisme ?*, Economica, Paris.

Boyer Robert (2013), "The global financial crisis in historical perspective: an economic analysis combining minsky, hayek, fisher, keynes and the regulation approach", in "Accounting, Economics and Law: A Convivium" in the special issue "Banking, Financial Instability, and the Minsky Instability Hypothesis".

Boyer Robert, Dehove Mario, and Dominique Plihon (2004), 'Les crises financières: analyse et propositions [Financial crises : analysis and recommendations], *Rapport du Conseil d'Analyse Economique*, 50, Paris.

Brynjolfsson Erik and Lorin M. Hitt (2003), "Computing productivity: firm-level evidence", *The Review of Economics and Statistics*, Vol. 85, n° 4, November, p. 793-808.

Centre d'Etudes des Revenus et des Coûts (1969), « Surplus de productivité globale et compte de surplus », *Documents du CERC*, n° 1, 1<sup>er</sup> semestre.

Champernowne David G. (1953–54), “The Production Function and the Theory of Capital: A Comment”, *Review of Economic Studies*, 21:1, p. 112–35.

Christensen Laurits R., Cummings Dianne, and Dale W. Jorgenson (1980), “Economic Growth, 1947-1973: An International Comparison”, in John W. Kendrick and Beatrice Vaccara, eds., *New Developments in Productivity Measurement and Analysis*, NBER Conference Report, Chicago, University of Chicago Press.

Clark John Bates (1891), “Distribution as Determined by a Law of Rent.”, *Quarterly Journal of Economics*, April, 5:3, p. 289–318.

Clark John Bates (1901), “Wages and interest as determined by marginal productivity”, *Journal of Political Economy*, Vol.10, n° 1, December, p. 105-109.

Cohen Avi. J. Harcourt, G. C. (2003), “Whatever Happened to the Cambridge Capital Theory Controversy”, *Journal of Economic Perspectives*, Vol. 17 (1), p. 199-214.

Conyon Martin J., Peck Simon I. And Graham V. Sadler (2001), “Corporate tournaments and executive compensation: evidence from the U.K.”, *Strategic Management Journal*, Vol. 22, n° 8, August, p. 805-815.

Corrado Carol, Hulten Charles, and Daniel Sichel (2009), “Intangible Capital and US Economic Growth”, *Income and Wealth*, 55, p. 661-685.

Crafts Nicholas (1992), “Productivity growth reconsidered”, *Economic policy*, Vol. 7, n° 15, October, p. 387-426.

Delarue Antoine (1975), « Elements d'économie néo-ricardienne. I – Structure de production et règle de répartition », *Revue Economique*, Vol. 26, n° 2, p. 177-197.

Denison Edward F. (1962), “Sources of Growth in the United States and the Alternatives before Us”. *Supplement Paper 13*, New York, Committee for Economic Development.

Dobbelaere S. and J. Mairesse (2011), Panel Data Estimates of the Production Function and Product and Labor Market Imperfections, forthcoming *Journal of Applied Econometrics*.

Dosi Giovanni (2005), “Statistical regularities in the evolution of industries”, LEM Working Papers 21, October.

Douglas Paul H. (1934), *The Theory of Wages*, New York.

Douglas Paul H. (1938), “Professor Cassel on the Statistical Determination of Marginal Productivity”, *The Canadian Journal of Economics and Political Science / Revue canadienne d'Economie et de Science politique*, vol. 4, n° 1, February, p. 22-33.

Eichengreen Barry (2003), “Les crises récentes en Turquie et en Argentine sont-elles les dernières d'une espèce en voie de disparition ?”, *Revue d'économie financière*, n° 70, Janvier, pp. 51-64.

Florida Richard (2002), *The rise of the creative class – And how it's transforming work, leisure and everyday life*, Basic Books, New York.

Frank, R.H. (1984): Are Workers Paid their Marginal Products, *American Economic Review* 74, p. 549 - 571.

Freyssenet Michel (ed.) (2009), *The second automobile revolution. Trajectories of the world carmakers in the 21<sup>st</sup> century*, Palgrave MacMillan, Basingstoke and New York.

Freyssenet Michel (2012), Renault trough the crisis: commercial bets and political tensions, Gerpisa colloquium, <http://gerpisa.org/biblio>.

Freyssenet Michel, Mair Andrew, Shimizu Koichi and Guiseppe Volpato (1998), *One best way? Trajectories and industrial models of the world's automobile producers*, Oxford University Press, Oxford.

Garber Peter M. (2000), *Famous First Bubbles: The Fundamental of Early Mania*, Cambridge, MIT Press.

Georgescu-Roegen N. (1935), "Fixed coefficients of production and the marginal productivity theory", *Review of Economic Studies*, Vol. 3, n° 1, October, p. 40-49.

Godechot Olivier (2001), *Les traders: Essai de sociologie des marchés*, La Découverte, Syros, Paris.

Gottschalk, P.T. (1978): A Comparison of Marginal Productivity and Earnings by Occupation, *Industrial and Labor Relations Review* 31, pp. 368 - 378. Hahn Frank (1966), "Equilibrium Dynamics with Heterogeneous Capital Goods", *Quarterly Journal of Economics*, Vol. 80, p. 633-46.

Gottschalk, P.T., J. Tinbergen (1982): Methodological Issues in Testing the Marginal Productivity Theory, *De Economist* 130, pp. 325 - 335.

Hall Robert (2001a), "Struggling to understand the Stock Market", *AER*, 91, May 1-11.

Hall Robert (2001b), "Stock Market and Capital Accumulation", *AER*, 91, p. 185-202.

Handsaker Marjorie L., and Paul Douglas (1937), "The theory of marginal productivity tested by data for manufacturing in Victoria", *The Quarterly Journal of Economics*, Vol. 52, n° 2, February, p. 215-254.

Harcourt (1969), "Some Cambridge controversies in the theory of capital", *Journal of Economic Literature*, Vol. 7, n° 2, p. 369-405.

Hellerstein, J.K., D. Neumark, and K.R. Troske (1999): Wages, Productivity, and Worker Characteristics: Evidence from Plant-Level Production Functions and Wage Equations, *Journal of Labor Economics* 17, pp. 409 - 446.

Hicks J.R. (1932), "Marginal productivity and the Lausanne School: A reply", *Economica*, n° 37, p. 297-300.

Hildenbrand G., T.C. Lui (1957), *Manufacturing Production Functions in the United States 1957. An Interindustry and Interstate Comparison of Productivity*, Cornell University, Ithaca.

- Kaldor Nicholas (1955-56), "Alternative theories of distribution", *The Review of Economic Studies*, Vol. 23, p. 94-100.
- Kendrick J. (1994), "Total Capital and Economic Growth", *Atlantic Economic Journal*, Vol. 22
- Keynes John-Maynard (1936), *The General Theory of Employment, Interest and Money*, London, MacMillan.
- Kindleberger Charles P. (1978), *Manias, panics and crashes*, Basic Books, New York.
- Kirman Alan (1992), "Whom and what does the representative individual represent?", *Journal of Economic Perspectives*, Vol. 6, n° 2, Spring, p. 117-136.
- Knight F. H. (1925), "A note on Professor Clark's illustration of marginal productivity", *Journal of Political Economy*, Vol. 33, n° 5, October, p. 550-553.
- Kurz Heinz D., and Neri Salvadori (1993), "Von Neumann's growth model and the 'classical' tradition", *The European Journal of the History of Economic Thought*, 1(1), August, p. 129-160.
- Lazear Edward P. (2000), "Performance pay and productivity", *The American Economic Review*, Vol. 90, n° 5, December, p. 1346-1361.
- Lundvall Bengt-Ake, Arundel Anthony, Lorenz Edward, and Antoine Valeyre (2007), "How Europe's economies learn: a comparison of work organization and innovation mode for the EU-15", *Industrial and corporate change*, Vol. 16, n° 6, p. 1175-1210.
- MacDonald Don N. and Morgan O. Reynolds (1994), "Are baseball players paid their marginal products?", *Managerial and Decision Economics*, Vol. 15, n° 5, Special Issue: The economics of sports enterprises, September-October, p. 443-457.
- Massé Pierre, Bernard P. (1969), *Les dividendes du progrès*, Le seuil, Paris.
- North Douglass C. (1990), *Institutions, Institutional Change and Economic Performance*, Cambridge University Press, Cambridge UK.
- OECD (1996), *The Knowledge Based Economy*, Paris, OECD.
- Orlean André (1990), « Le rôle des influences interpersonnelles dans la détermination des cours boursiers » [The role of inter-personal influences in determining share prices], *Revue économique*, 41, pp. 839-868.
- Orlean André (2004), « Efficience, finance comportementale et convention : une synthèse théorique », dans *Les crises financières. Rapport de Conseil d'Analyse Economique*, 50, Paris, La Documentaion Française, p. 241-270.
- Robinson Joan (1946), *The Economic of imperfect Competition*, MacMillan, Londres.
- Robinson Joan (1953-54), "The Production Function and the Theory of Capital.", *Review of Economic Studies*, 21:2, p. 81-106.
- Robinson Joan (1956), *The Accumulation of Capital*, MacMillan, Londres.



- Robinson Joan (1967), "Marginal productivity", *Indian Economic Review*, New series, Vol. 2, n° 1, April, p. 75-81.
- Romer Paul (1994), "The origins of endogenous growth", *The Journal of Economic Perspectives*, Vol. 8, n° 1, p. 3-22.
- Salter W.E.G (1966), *Productivity and Technical Change*, 2nd ed., Cambridge University Press, Cambridge.
- Samuelson Paul, and Franco Modigliani (1966), "Marginal productivity and the macro-economic theories of distribution: a reply to Pasinetti and Robinson", *The Review of Economic Studies*, Vol. 33, n° 4, October, p. 321-330.
- Schultz H. (1932), "Marginal productivity and the Lausanne School", *Economica*, vol XII, n° 37, August.
- Schumpeter Josef (1911), *Theorie der wirtschaftlichen Entwicklung*.
- Schumpeter Josef (1954), *History of Economic Analysis*.
- Shiller, R. J. (2000), *Irrational Exuberance*, Princeton, NJ, Princeton University Press.
- Shiller, R. J. (2003), "From efficient markets theory to behavioral finance", *Journal of Economic Perspectives*, 17, p. 83-104.
- Shleifer Andrei (2002), *Inefficient markets*, Oxford, Oxford University Press.
- Solow Robert (1956) « Technical Change and the Aggregate Production Function », *The Review of Economics and Statistics*, vol. 39, No. 3. Aug., n° 1, p. 312-320.
- Solow Robert (1956) « A Contribution to the Theory of Economic Growth », *Quarterly Journal of Economics*, vol. 70, n° 1 p. 65-94
- Solow Robert (1963), *Capital theory and the rate of return*, North Holland, Amsterdam.
- Sraffa Piero (1926), "The Laws of Returns under Competitive Conditions", *Economic Journal*, December, p. 535-550.
- Sraffa Piero (1960), *Production of Commodities Means of Commodities*, Cambridge, CUP.
- Stein J. L. (1958), "The predictive accuracy of the marginal productivity theory of wage", *Review of Economic Studies*, Vol. 25, n° 3, June, p. 182-189.
- Stiglitz Joseph (1974), "The Cambridge-Cambridge controversy in the Theory of Capital: A view from new Haven. A review article, *Journal of Political Economy*, Vol; 82, n° 4, July-August, p. 893-903.
- Templé Philippe (1971), « La méthode des surplus, un essai d'application aux comptes des entreprises », *Economie et Statistiques*, n° 29, p. 33-50.

Thurow, L.C. (1968), "Disequilibrium and the Marginal Productivity of Capital and Labor", *Review of Economics and Statistics*, 50, p. 23-31.

Valiente Wilfredo Santiago (1980), "Is Frank Knight the Victor in the Controversy between the two Cambridge History of Political Economy", *Spring*, 12 (1), p. 41-64.

Van Ark Bart, Hao Janet X., Corrado Carol and Charles Hulten (2009), "Measuring Intangible Capital and its Contribution to Economic Growth in Europe", *IEB Papers*, Vol. 14, N° 1, p. 62-93.

Veblen Thorstein (1901), "Industrial and pecuniary employments", *American Economic Review*,

Veblen Thorstein (1908), "Professor Clark's economics", *The Quarterly Journal of Economic*, February, p. 147-195.

Veblen Thorstein (1908), "On the nature of capital", *The Quarterly Journal of Economic*, February, p. 147-195.

Vincent André L.A. (1971), "Indices et surplus de productivité globale. Etude méthodologique comparative », *Revue Economique*, Vol. 22,n° 1, p. 1-12.