Economic Progress and the Analysis of Stakeholder Responsible Behavior of the Firm

Abstract

Davis's (1947) contribution is revisited. He can be considered as an early precursor of stakeholder theory as most of the relevant concepts of the theory can be found in his contribution. Davis's work allows the integration of concepts like economic progress, sustainability and stakeholder responsibility inside the theory. The economic progress, as a main topic of his thoughts, is driven by three conditions: i) productivity growth, ii) quick re-employment of resources and iii) balanced distribution of wealth. We contribute analyzing the relationship of theses concepts and conditions with the dynamics of value creation and accumulation by the firm and its distribution to the stakeholders. It is introduced in the discussion the company stakeholder responsibility as a firm behavior that could enhance the economic progress, particularly when a downsizing situation is faced by the economy. The compensation mechanisms of the responsible behavior are analyzed in order to know the limits of such behavior.

1. Introduction

Our objective is to revisit the concept of economic progress proposed by Davis (1947), an early proponent of a broad view of economic progress in which a range of stakeholders participate. Davis's work allows the integration in the stakeholder theory of concepts like economic progress, sustainability and stakeholder responsibility. Davis considered productivity growth to be the sole driver, but not the only component, of economic progress. Davis considered economic progress, driven by productivity growth, to incorporate (i) sufficient output growth to create a rapid re-employment of resources, labor in particular, displaced by productivity growth; (ii) a balanced distribution of the wealth created by productivity growth; (iii) provision of "seed" capital for future production; and (iv) imposition of minimal social costs, such as the impairment of health and the wasteful use of resources. Each component is necessary for productivity growth to translate into economic progress.

Our contributions are (a) to move the analysis of economic progress from the sectoral (industry) level of aggregation considered by Davis to where economic progress originates, at the level of the individual firm, which Davis mentioned but did not pursue; and (b) to develop an analytical framework within which economic progress and its components identified by Davis can be studied; c) the social responsibility of the firm and its sustainability is reviewed through the concept of stakeholder responsibility, borrowed from Freeman and Velamuri (2005).

The paper is organized as follows. In Section 2 we review Davis's contributions as precursor of stakeholder theory and we revisit the debate, much of which occurred in the 1940s, on necessary conditions, and sufficient conditions, for economic progress. We also discuss the contribution of a stakeholder responsible firm to economic progress; this addresses component (a). In section 3 the stakeholder responsibility concept is reviewed. In Section 4 we analyze the process of value creation in the firm and the distribution of this value to various stakeholders, of which Davis identified six; this addresses component (b). In Section 5 we discuss the sustainability of the firm and the balance of the distribution of the value it creates; this addresses components (b) and (c). In Section 6 we discuss re-employment of displaced resources in growing and contracting economies, and the relationship linking re-employment with social responsibility and sustainability; this addresses components (a) and (b). In Section 7 we discuss the stakeholder responsibility of

the firm versus labor; this addresses component (c). In Section 8 we explore the mechanisms by which a firm can compensate for its stakeholder responsibility; this addresses component (c). Section 9 concludes.

2. Hiram S. Davis

2.1 Hiram S. Davis & Stakeholder Theory

Davis, as a major research associate of the Industrial Research Unit at Wharton School[xi], contributed to the debate of economic progress in the context of the US recession in the 1930s and the turbulent period of World War II in the 1940s. He served in the government as Secretary of the Textile Committee under the Combined Production and Resources Board during wartime (1943-1945). As part of his governmental responsibility he developed textile studies[xii] but after he focused his interest on the study of industrial systems, economic progress and productivity in "Studies of the Industrial System" (1944), “Industrial Study of Economic Progress” (1947) and "Economic History from Accounting Records” (1955a) and “Productivity Accounting” (1955b). In 1953, the Industrial Research department became a unit of the Wharton School's Department of Industry. Later, in 1968, it was renamed as the Department of Management. It is interesting to note that Wharton School had a relevant role in the development of stakeholder theory, as summarized by Freeman and Velamuri (2005), when recalling that some precursor works of stakeholder theory were carried out over ten years through the Busch Center, the Wharton Applied Research Center, and the Managerial and Behavioral Science Center. All of them were department members of the Warthon School at University of Pennsylvania. It is worth noting that “the study of economic and social problems of business” was the foundational mission of this school (1921). This mission was very close to the topics of interest of stakeholder theory and it is not a surprise that Davis’s contributions are in alignment with the future stakeholder theory.

Hiram S. Davis (1947) in his work “The Industrial Study of Economic Progress” intended the study of the conditions that stimulate or delay economic progress. It has its origins in discussions of staff in the post-war program of the Industrial Research Department. During the discussion it becomes apparent that “*no more important objective could be set for industry studies than that of increasing our knowledge of the conditions which stimulate and those which retard economic progress*” (p. vii). Some of the pillars of

stakeholder theory can be found in Davis's work and that is why we consider him as one of their precursors.

We start the review with the problem of stakeholder identification. Davis (1947) had in mind the same concept that Clarkson (1995) used almost 50 years later. He was completely in agreement with Clarkson's definition of primary stakeholders. Davis listed six possible stakeholders in the distribution of the benefits derived from an increase in efficiency. Davis named them as *participants* instead of *stakeholders* but the definitions are compatible. In Davis's words (Davis, 1947:95) the participants were:

> *i) customers, who may receive their benefit in lower prices or improved product, ii) wage or salary workers, who may receive their benefit in such forms as higher wage and salary rates, bonuses of various sorts, and shorter hours, iii) suppliers, who may receive higher prices for materials, iv) the enterprisers and investors who may receive higher dividend rates (or an increased equity in the business), v) the business itself, which may increase its retained earnings, vi) the government, which will share through taxes any benefit which accrues as profit.*

Second, it is considered as a main point of interest for the economic progress analysis (Davis 1947,1) that *"the painful adjustments on the part of all those who are associated with the production process"* derived from progress jerks and rushes previously mentioned by Schumpeter (1939). Davis indicated that the victims of the adjustment, whether farmers, laborers, manufacturers or investors, want to seek protection. They look for security. We consider that, in terms of stakeholder theory terminology, they are dealing with the effects of the achieved firm objectives regarding economic progress. It is interesting to note that Davis (1947) cites Professor Walker, who was in the service of Australian government, calling for adding goals of a minimal standard of consumption and improved working conditions to objectives of increased production and economic freedom even at the expense of some *freedom* and some *productive efficiency*. It means that Davis includes the notion of sacrificing efficiency in order to have an alternative benefit for society. Finally Davis wondered (Davis 1947,2) *"How far can we assure security and not stifle progress, the creator of abundance?"* and also mentioned *"may this emphasis on security aspects mean that we will unintentionally does not choke or impede progress?"*.

Third, Davis worried about the social cost of economic progress. He integrated in his contribution a preliminary vision of the stakeholder point of view, particularly focused on labor and re-employment because he was influenced by the long unemployment interval of '30s. He had to admit that America had known economic progress through the transition from an agricultural to an industrial and trade model. America experienced a technological development leading to a higher level of consumption despite unemployment and other social costs. Being fully aware of variability in the assessment of these social costs depending on subjective matters, Davis declared (1947,11):

> *In seeking to read social cost qualification into the "progress" concept, we are reacting in part to a group conscience which tells us that such costs ought not to be, or at least are much higher than they should be. If this urge is recognized, it becomes clear that "economic progress" should not be defined in terms of some stated level of social costs, for, at best, that would vary with the standards of each generation, and, at worst, would reflect personal biases.*

In Davis's thinking social costs have to be separated from the definition of economic progress to avoid a subjective bias. The accuracy of this assessment can be seen in the increase of sensitivity regarding the social cost through the 20th century up to now. He mentioned that the economic progress desired should come at the lowest social costs. Later we will discuss extensively the notion of Davis's economic progress concept.

Fourth, Davis (1947,133) recognized the impact of technological developments on stakeholders, we outline in the following paragraph:

> *Since economic progress involves shifting of men from one employment to another, some persons may suffer considerable economic loss by the shift even when it occurs fairly rapidly. If the new jobs do not require the same experience or skills as the old, those persons whose specialized experience brought them relatively high compensation on the old jobs are most likely to find re-employment only at new jobs carrying lower rates of compensation. Economic progress can also mean great loss of income to the investors who happen to own the particular facilities which are outmoded by technological developments.*

Fifth, Davis (1947,132) also included in his analysis the social cost of the progress and how it affects society in general. He identified as social costs the insecurity of jobs and income, and changes in social relationships of individuals and families, changes in the way of life of a whole community or in the social and political organization, changes in the social standards and traditional values of the whole society when economic progress is achieved. Additionally he discussed the potential wasteful use of natural resources to achieve progress. He mentioned the importance of the relationship between progress and the use of natural resources. Furthermore he thought that the use of natural resources ceased to be part of the study of the *cost of progress* and became a part of the study of the conditions of productive efficiency because at the end of the day, the increases in productivity shall mean a more rational use of natural resources and less waste of them. Looking at the whole picture of these social costs we can realize that Davis was worried about the same issues that are the focus of the stakeholder way of thinking, how the firm influence the stakeholders through changes in social behavior and how the stakeholders can influence the firm to get the desired economic progress. Davis took care of the necessary environmental care as a part of the discussion when economic progress is pursued.

Finally it is worth mentioning the social dimension of Davis when he states that economic progress shall be achieved by means of no wasteful practices. This ending adds a social dimension to his work as it is even more aligned, if this is possible, with the thinking of stakeholder theory. Wasteful practices incorporate in the discussion the responsibility towards the environment. Inefficiency in the production process, for instance regarding energy inputs, leads to the use of extra resources that could be saved using efficient technology or work organization. Applying this philosophy will keep the use of the environmental resources needed to manufacture the goods more effective. As Davis mentioned (Davis 147,141) in the US (Ducktown, Tenesee) and as can be seen in the rest of the world progress has frequently damaged the environment and spoiled natural resources. It is a relevant conclusion to include this approach in the economic progress discussion as Davis did. No less important is the prohibition of unsocial practices that leads the decisions of the firm towards corporate social responsibility that, as it is known, has also been a main axis in the stakeholder theory.

We consider, as Davis did, that firms are value creation engines and that it is necessary to preserve them to achieve the economic progress of society. As a consequence

the firms have to be sustainable when achieving their objectives. Sustainability[xiii] and social responsibility of the firm have been discussed extensively in the literature, including stakeholder theory[xiv], but they have not been cross linked to economic progress. It will be a contribution of this chapter to define how these concepts can be interrelated and how they can be included in the framework of stakeholder theory[xv]. Furthermore, we seek the clarification and definition of sustainability of the firm and how the sustainability of the firm[xvi] is related to economic progress. It is interesting to note that Pezzey and Toman (2002) concluded after reviewing twenty five years of journal articles about sustainability that there is a lack of common understanding about sustainability[xvii]. It is proposed that firm sustainability is achieved when firms retain (at least part of) the value created. We will discuss later the background of the concept of sustainability and its relationship with economic progress.

2.2. Hiram S. Davis & Economic Progress

After reviewing the literature of economic progress we decided to retrieve the theoretical framework of economic progress exposed by Davis as it contains precursor concepts of the stakeholder theory. As far as we know the contribution of Davis related to economic progress has not been analyzed in depth. The stakeholder literature is not precise about what economic progress is. Retrieving Davis's contribution we can shed light on the debate about what should be the social responsibility of the firm and how this behavior contributes to economic progress. We consider that it is worthwhile analyzing his contribution 80 years later and see how it can help in the understanding of stakeholder management and economic progress.

Some years before Davis made his contribution, Fagan (1935) proposed a fairly broad definition of economic progress as moving forward toward "*increased production accompanied by a better quality of goods; by a decrease in the relative expenditure of life, labor, and natural resources necessary to produce them; and by an even wider distribution of the resulting wealth*[xviii]". Nonetheless Davis criticized Fagan's definition on the ground that it omits "*greater economy in the use of productive factors*," (Davis 1947,6) which Davis argued is a more fundamental factor in economic progress than expanding output, "*for it is only by means of greater efficiency in per unit output that total output can outstrip population growth*" (Davis 1947,7).

Ayres (1944) also contributed to the discussion proposing that for achieving economic progress it is sufficient to have productivity growth. Davis adopted the concept but adding some more necessary conditions that shall be taken into consideration because, as Davis (1947,12) stated, productivity growth is not enough to guarantee economic progress.

Retrieving the central thinking of Davis (1947), economic progress means "*increasing the productivity accompanied by a distribution of the resulting gains so complete that they are shared by every member of the community and accomplished without any idleness of men or machines, or wasteful or unsocial practices*" (Davis 1947,9). What he really meant by increasing productive efficiency leading to a higher level of consumption is increasing efficiency which is accompanied or followed by an expanding production of goods and services. In other words, the agents of production released from one employment by improvement methods sooner or later find another and thus make further rise in the total output of all goods and services possible. Thus, in Davis's words, "*the research about the conditions of economic progress should center on those which make for a) increasing productive efficiency, b) relatively rapid re-employment, and c) balanced distribution and use of the income*" (Davis 1947,12).

The starting point of Davis's thought indicates that the worth created by the firm is only the part corresponding to the gains of productivity. Davis (1947, 7) pointed out that only the productivity increments will lead to an increase in the absolute quantity of economic worth.

> *When we referred to increased production being obtained by greater economy in the use of productive agents, we simply meant more units of output for a given use of labor, capital equipment, managerial talent, materials and other factors. To the extent that such savings can be made through new or improved processes, new or improved methods of work and organization, or improved quality of productive factors, it is possible to secure a larger output of the same goods or of different goods, as society may choose.*

It is interesting to note Davis's list of business improvements can be classified as technical or economic change. Hence, technical change, and related increase in productivity, is presented as the main driver of economic progress. Shumpeter (1934) made the initial contributions to the theory of economic development and value creation through

the process of technical change and innovation. He introduced the concept that some rents become available to entrepreneurs when a technological change is introduced (Shumpeter 1942). Recently, Teece (2000) remarked that there is no doubt that technological innovation is the primary driver of economic growth. Nadolny (2010) reviews the rich tradition of economic literature that explains how and why innovation is fundamental to the competitive success of firms. Innovation includes not only technical change to a product or process, but new and better approaches to marketing, distribution and servicing. Nadolny (2010) summarizes that innovation should result in greater productivity because a larger quantity or a better product is produced. Innovation allows a firm to pursue a business strategy focused on cost as it makes it feasible to achieve more output per unit of labor or capital. It also allows a differentiation strategy because new or higher quality of goods or services can be produced, leading to an increase in the price of the output per unit of factor input (Porter 1990, Silverberg and Verspagen 1994). It also has been stated that firms that achieve higher productivity increase their propensity to access distant markets (Fagerberg 1994, Wakelin 1998). Despite the impact of innovation in the performance of the firm, Teece (2010) notes that how and why some firms tap into technical opportunities remains enigmatic. We have to add, as Davis did, that innovation and technological change lead to some relevant social collateral effects that have to be taken into consideration and they oblige firms to position themselves and to behave accordingly in front of the stakeholders. Some firms will try to maximize their own profit regardless of other matters and some will take a socially responsible approach taking more care of their stakeholders. This creates a dichotomy that we will analyze in the next section.

Davis also considers as source of economic worth the increase of output price, but only when it reflects an increase in the quality of the product. In that case the firm is not using its capacity of influence. Conversely when the increase of output prices is achieved using its capacity of influence, it is only a rent transfer from the consumer to the firm. These transfers cannot be considered as created value that leads to economic progress. For clarity of the analysis we are not going to consider explicitly the issue related to the quality of goods.

Davis (1947,12) stated clearly that the increment in productivity is not a sufficient concept regarding economic progress. It is only the first condition that should be accompanied by two more of them:

But more output for a given input is not enough. In fact, increasing efficiency could be self-defeating if the labor and other resources saved by improved technology were not sufficiently re-employed to bring about further expansion in national output,..., Thus, research about the conditions of economic progress should center on those conditions which for (a) increasing productive efficiency, (b) relatively rapid re-employment, and (c) balanced distribution and use of income.

The condition related to the reemployment of resources drives us to an interesting turn of our discussion. When this aspect is considered from the perspective of the firm we realize that the current economic theories defend that the firm has to be as efficient as possible in order to maximize profits and survive in the long term. In this framework it seems to be completely justified to adjust the resources in order to achieve this objective because if the firm does not adjust its resources it is likely to end up as Scherer and Ross (1990, 48) stated:

No matter how strongly managers prefer to pursue other objectives, and no matter how difficult it is to identify profit-maximizing strategies in a world of uncertainty and high information costs, failure to satisfy this criterion means ultimately that a firm will disappear from the economic scene.

When the stakeholder point of view is added to the discussion, particularly when the affected stakeholder is labor, the justified adjustment of resources means more people unemployed and social aspects have to be taken into consideration. The desired economic progress is not achieved if unemployed people have difficulty in being contracted again in other new productive alternatives. This known mismatch affects economic progress, as Davis introduced, and it seems reasonable to discuss what can be done to make the lateral displacement of labor from one sector to other as easy as possible. It is also no less important to take the right social measures when the economic cycle is in the downsizing phase. In this case, as we usually observe in most of the economies, the impact is not negligible and any measure to avoid an extension of the recessive phase should be taken as a part of the sustainability and social responsibility discussion.

In the next subsections we analyze the implications of Davis's concept of economic progress not only considering the productivity aspects. As Davis proposed it will include the implications of the second condition, the reemployment of resources, particularly when discussing about human resources. The third condition will drive to the analysis of the meaning and consequences of a balanced distribution.

In order to finish this section we introduce our definition of Economic Progress, in the sense of Davis, which is stated as

***Definition of (firm contribution to) Economic Progress*:**

A firm is contributing to economic progress when it achieves an increase in productivity, where the released resources are quickly re-employed and then the created wealth from the productivity gains is redistributed following a balanced strategy.

An extension of this definition is:

A firm is called socially responsible when it contributes to the economic progress.

3. Company Stakeholder Responsibility

As usually happens when discussing economic concepts it is almost unavoidable to avoid having two opposed behaviors of the firm: on one hand we have the firm that only has the objective of maximizing profits (Friedman 1970) and on the other hand the firm that cares about the stakeholders, the social cost of its actions and tries to be socially responsible (Freeman 1984). This is the old debate known as the *separation thesis* (Carrol 1979, Wicks 1996).

It is important to introduce here that Freeman and Velamuri (2005) designed a new model named *Company Stakeholder Responsibility* in opposition to the classical *Corporate Social Responsibility*[xix], trying to solve the dichotomy between business and social responsibility created by the separation thesis. Only a few authors like Kornum (2007) have adopted the concept Company Stakeholder Responsibility for his analysis and the potential of this concept remains to be explored. The Company Stakeholder Responsibility model fits better in our approach than the Corporate Social Responsibility and in what follows we discuss why it is more useful to deal with Company Stakeholder Responsibility in the context of this work than with the general term of socially responsible firm or Corporate Social Responsibility.

Freeman and Velamuri (2005) confessed to having absolute no idea of what *socially responsible* means when a firm makes the products that consumers like and those products make their lives better. When suppliers want to do business with the company because they benefit from this relationship. When employees really want to work for the company and are satisfied with their remuneration and professional development. When the management are good citizens in the communities where they are located. When they pay taxes and make attractive return on capital for shareholders and other financiers. An "ideal" firm that is doing as this deserves to be applauded and to be an example for others. Freeman and Velamuri (2005) wondered: Does this ideal firm need to apply any corporate socially responsible policy? They answered themselves "No". It does not as the right way of doing business should integrate considerations of business, ethics and society. Their point is whether the firm takes the business approach of "creating value for stakeholders", acknowledging that ethics and values are important in these relationships, then the idea of Corporate Social Responsibility is just superfluous.

Freeman and Velamuri (2005) proposed the replacement of Corporate Social Responsibility by Company Stakeholder Responsibility as a new interpretation of the very purpose of Corporate Social Responsibility. In this new view Company Stakeholder Responsibility the *Company* signals all forms of value creation and trade and not only corporations. *Stakeholder* suggests that the main goal of corporate social responsibility is to create value for key stakeholders and fulfill the responsibilities to them. *Responsibility* implies that business can not be separated from ethics. We agree with that approach. Freeman and Velamuri (2005) argue that Company Stakeholder Responsibility avoids the promotion of the separation thesis. Company Stakeholder Responsibility solves the idea that business issues and social issues can be dealt with separately because this idea has the underlying theme that business is either not good or is morally neutral. Using this concept the stakeholder approach easily takes into consideration the intertwined nature of economic, political, social and ethical issues. It is centered on the practice of management, and provides the manager with a pragmatic framework for action. When discussing in the following sections about economic progress and social responsibility we will take this approach.

In this chapter the role of the socially responsible firm is considered to be a relevant part of the economic progress debate. After our analysis we are in a position to answer Freeman and Velamuri (2005) if their ideal firm is socially responsible. A firm is socially

responsible when it contributes to the progress of economy. The firm that adopts the Company Stakeholder Responsibility is intended to contribute to economic progress, and only when the objective of economic progress is achieved it can be considered as socially responsible. This definition has important implications for stakeholder management and it has a remarkable interest for stakeholder theory. We consider that the firm can express the stakeholder responsibility by more contracted workers than is strictly needed but this decision has important implications regarding the achievement of economic progress. As Davis worried about the impact of the firm on its stakeholders and recognized the alternative for the firm of losing some efficiency in order to achieve economic progress we consider that Davis was proposing a preliminary concept of the responsible stakeholder behavior of the firm and reinforcing the idea of its early contribution to the future stakeholder theory.

Combining Davis's concepts we have been able to define a theoretical background to deal with economic progress, sustainability and stakeholder responsibility of the firm compatible with the stakeholder theory. We have focused our analysis on stakeholder responsible decisions that affect human resources. The behavior of firm and stakeholders has been analyzed under these premises. When Davis's contribution is considered under the prism of stakeholder theory, significant implications are raised regarding the decisions to be taken by the firm. It defines how the value has to be created and how it has be distributed among the stakeholders. Also important lessons regarding the policy of regulators can be extracted.

4. Methodology

In order to make operative the concepts we have been discussing in the previous sections we describe here the methodology we will use to develop the theoretical framework regarding economic progress and stakeholder responsibility. Davis introduced the option of economic progress analysis to different levels of aggregation going from national to a single plant. We have selected the firm unit of analysis as relevant for our discussion as we consider that more aggregated levels are the additive consequence of single firm contributions. But, the methodology that we introduce can be applied to any level of aggregation from national, industrial, firm to plant level.

We introduce the methodological notation where an output quantity vector of a firm is expressed by $y = (y_1,\ldots,y_M) \in R_+^M$ and its price vector by $p = (p_1,\ldots,p_M) \in R_{++}^M$; an input quantity vector is expressed by $x = (x_1,\ldots,x_N) \in R_+^N$ and its price vector by $w = (w_1,\ldots,w_N) \in R_{++}^N$. We have omitted the firm's subindex by way of maintaining a simple notation. When more than one firm is involved in the discussion, we will use the corresponding subindex to differentiate them. The set of technologically feasible combinations of output vectors and input vectors is given by the production set $T = \{(y,x)$: x can produce $y\}$, which is assumed to be closed and bounded, and to satisfy no free lunch and monotonicity assumptions (Kumbhakar and Lovell 2000). We define operating profit π as the difference between the revenue generated by outputs and the cost of employing the inputs used to produce those outputs, where revenue $R = p^Ty = \Sigma p_m y_m$ and cost $C = w^Tx = \Sigma w_n x_n$ and $\pi = R - C \gtreqless 0$. The N^{th} component of cost is the cost of capital, $w_N x_N = w_N K$, with w_N being the unit cost of capital and K the stock of capital. We consider two time periods indicated by superscripts t and t+1 on variables.

A subsequent work of Davis (1955), which complements his 1947 work, explores the notion of productivity and productivity gains. In this context, and from an accounting perspective, $w_N K$ is defined by the depreciation and amortization expenses. Davis (1955) also introduces the concept of *investor input*. The central idea is that the operating profit of the firm belongs to the investors. This operating profit is defined in fact by earnings before interest and taxes. The operating profit is considered a return to investors who have to decide its allocation. It depends on the decision about the financial structure of the firm (proportion of equity vs. liabilities). From here, the thesis adopts the word *investor* in front of others like shareholders or stockholders. Grifell-Tatjé and Lovell (2014) have studied the theoretical implications of this approach that we follow, borrow the notation, and adapt it to the context of the stakeholder theory.

Davis (1955) treats operating profit π as a return to investors, and so $\pi = rK \Rightarrow r = \pi/K$, r being the rate of return to investors, which redefines profit as $\breve{\pi} = R - (C + rK) = R - \breve{C} \equiv 0$, with $\breve{C} = \breve{w}^Tx = w_1x_1 + \ldots + w_{N-1}x_{N-1} + (w_N + r)K$ and $\breve{w}$ coincides with w apart from the final component where $\breve{w}_N = (w_N + r)$. We write the difference between profits in periods t and t+1 as

$$\breve{\pi}^{t+1} - \breve{\pi}^t = (p^{t+1T}y^{t+1} - p^{tT}y^t) - [(w^{t+1T}x^{t+1} + r^{t+1}K_0^{t+1}) - (w^{tT}x^t + r^tK^t)]$$

$$= [p^{tT}(y^{t+1} - y^t) - w^{tT}(x^{t+1} - x^t) - r^t(K_0^{t+1} - K^t)] +$$

$$+[y^{t+1T}(p^{t+1} - p^t) - x^{t+1T}(w^{t+1} - w^t) - K_0^{t+1}(r^{t+1} - r^t)], \qquad (1)$$

in which K_0^{t+1} is the deflated value of period t+1 capital. Since $\breve{\pi}^t = \breve{\pi}^{t+1} = 0$, the profit change in (1) is also equal to zero. The first term on the right side of (1) is a quantity effect, and the second term is a price effect, each showing the impact of quantity changes and price changes on profit change. Since profit change is zero by construction, the price effect is the negative of the quantity effect, showing a sort of duality between prices and quantities.

The quantity effect has Laspeyres form, with quantity changes weighted by period t prices (one of which is r^t, the period t rate of return to investors), and the price effect has Paasche form, with price changes weighted by period t+1 quantities (one of which is the deflated period t+1 capital stock). In the quantity effect capital change is weighted twice and can be expressed as $(w_N^t + r^t)(K_0^{t+1} - K^t) = \breve{w}^t_N(K_0^{t+1} - K^t) = \breve{w}^t_N(x_N^{t+1} - x_N^t)$. The fact that $\breve{\pi}^t = 0$ enables us to rewrite the first expression of the right-hand side of (1), the quantity effect, as

$$p^{tT}(y^{t+1} - y^t) - w^{tT}(x^{t+1} - x^t) - r^t(K_0^{t+1} - K^t) = p^{tT}y^{t+1} - \breve{w}^{tT}x^{t+1}, \qquad (2)$$

Additionally, we can express (2) as

$$p^{tT}y^{t+1} - \breve{w}^{tT}x^{t+1} = \breve{w}^{tT}x^{t+1}[(p^{tT}y^{t+1}/p^{tT}y^t)(\breve{w}^{tT}x^t/\breve{w}^{tT}x^{t+1}) - 1]$$

$$= \breve{w}^{tT}x^{t+1}[(Y_L/\breve{X}_L) - 1], \qquad (3)$$

in which $Y_L = p^{tT}y^{t+1}/p^{tT}y^t$ is a Laypeyres output quantity index, $\breve{X}_L = \breve{w}^{tT}x^{t+1}/\breve{w}^{tT}x^t$ is a Laspeyres input quantity index, and $Y_L/\breve{X}_L$ is a Laspeyres total factor productivity index. $Y_L/\breve{X}_L \gtreqless 1$ signals productivity growth, stagnation or decline, and scaling $[(Y_L/\breve{X}_L) - 1]$ by $\breve{w}^{tT}x^{t+1}$ generates $p^{tT}y^{t+1} - \breve{w}^{tT}x^{t+1} \gtreqless 1$, the value created by productivity change. Thus Davis' practice of expensing investor input ensures that the quantity effect coincides with the productivity effect. This makes the negative of the price effect a dual productivity effect. The concept of a dual price-based productivity index apparently was introduced by Siegel (1952), Fourastié (1957) was a prolific user of a dual productivity index.

Expression (3) measures value creation in the sense of Davis; it shows how productivity change: $Y_L/\breve{X}_L$, is transformed into money by the firm. This value generated, economic worth or productivity bonus, is distributed. We have using (1) and (2)

$$\breve{w}^{tT} x^{t+1} \left[\left(\frac{Y_L}{\breve{X}_L}\right) - 1\right] = -y^{t+1T}(p^{t+1} - p^t) + x^{t+1T}(w^{t+1} - w^t) + K_0^{t+1}(r^{t+1} - r^t) \quad (4)$$

When $Y_L/\breve{X}_L > 1 \Rightarrow \breve{w}^{tT} x^{t+1}[(Y_L/\breve{X}_L) - 1] > 0$, which measures the value created by productivity growth to be distributed to the stakeholders appearing on the right side of (4). The three groups of beneficiaries are consumers, suppliers of inputs (including capital) and investors. This process of distribution occurs through output prices, input prices and the return to capital in the firm. Furthermore, expression (4) makes operative the view of Davis (1947:Ch. VII) that the main mechanism of distribution of the generated worth is through prices.

Consumers capture value generated by productivity growth if $p^{t+1} < p^t$ implies that $-y^{t+1T}(p^{t+1} - p^t) > 0$. In general terms price reductions are expected to result from competitive pressure in product markets, unless of course the firm has bargaining power gained through product market power that enables it to avoid price reductions. As we note in Section 3, Davis (1947, Ch. VII) considered price increases as a source of economic value only when they are associated with higher quality or a broader range of products. Analysis of value capture by input suppliers and investors proceeds similarly, with $w^{t+1} > w^t$ and $r^{t+1} > r^t$, and with similar quality and bargaining power caveats.

It is a matter of interest the capture of worth coming from different stakeholders involved in the distribution process. It is particularly remarkable when the capacity of influence of one stakeholder is big enough to capture all the value generated. In that case no value will remain for distribution to the other stakeholders. This fact has relevant consequences because in this scenario economic progress cannot be achieved in the meaning of Davis because all the generated value is going only to one stakeholder and the others do not receive or capture any part of the distributed worth. In the case of suppliers any increase in the price of raw materials will have the effect of transferring economic value to them. The suppliers will look for different strategies to increment their part of the value captured (for instance increasing the quality of goods, using their negotiation power, trying to be monopolistic or giving additional services in order to become differentiated from other competitors and therefore increasing their capacity of influence).

The last term is related to the investors. It is worthwhile mentioning that the term is not corresponding directly to the increment of operating profit. However the term expresses the mechanism of distributing worth to investors through the increment ($r^{t+1} - r^t$). The r-shows the retribution of the stock of capital invested in the company. The amount of the worth retained by this stakeholder through the returns will be also linked to the concept of sustainability of the firm as we will see later.

The second condition of Davis's definition of economic progress states that the distribution of the generated value shall be balanced. Davis did not explain in detail what "balanced" meant. This omission opens a discussion about what is balanced or not regarding the percentage of value distributed to each stakeholder. In this paper, we adopt a weak meaning of *balanced*.

Definition of balanced distribution: The distribution of value is considered balanced when each group of involved stakeholders receives a non zero part of the economic worth generated by the firm.

In fact, we are proposing a *pan-distribution* definition. It requires that $x^{t+1T}(w^{t+1} - w^t) > 0$, $-y^{t+1T}(p^{t+1} - p^t) > 0$ and $K_0^{t+1}(r^{t+1} - r^t) > 0$ to obtain the weak definition of Davis's concept of balanced distribution. This pan-distribution means that each group of customers, suppliers and investors are the receptors of the productivity bonus of the firm.

5. Sustainability of the firm

The sustainability of the firm is associated with the economic worth created and the part of this worth that the firm is able to retain. To analyze the concept of sustainability we will use the expression (4), particularly the left hand side that measures, in monetary terms, productivity variations. The right side shows separately the different stakeholder groups that can be recipients of value distribution.

Before going ahead with the analysis of $Y_L/\tilde{X}_L > 1$ it has to be taken into consideration that the situation could happen where $Y_L/\tilde{X}_L < 1$. In terms of Davis this means that the firm is destroying value. But even if $Y_L/\tilde{X}_L < 1$, investors can still be in a position of retaining value, in other words, it is not compulsory that they lose worth ($K_0^{t+1}(r^{t+1} - r^t) < 0$). This situation could happen if $Y_L/\tilde{X}_L < 1$ but the customers pay more

for the same goods $p^{t+1} > p^t$ or the suppliers are paid less for the same inputs $w^{t+1} < w^t$. It is relevant in terms of sustainability of the firm to note that when $Y_L/\tilde{X}_L < 1$ the value retained by investors occurs through a simple value transfer from other stakeholders groups. The firm, through the productivity effect, is not contributing to its own sustainability. We consider that this situation is worse in terms of sustainability than when $Y_L/\tilde{X}_L > 1$ because the worth captured by the firm through the investors is only depending on the capacity of influence and not from its internal efforts and capabilities. We consider that the capacity of influence over the other stakeholders is a volatile effect that could be influenced by lots of circumstances out of the control of the firm.

We start thinking about what happens if the investors retain all the value generated through the left hand side of the expression (4) when $Y_L/\tilde{X}_L > 1$. All the effort made by the firm in order to achieve new or improved processes, new or improved methods of work and organization, or improved quality of productive factors remains for the shareholders. The retention of this value contributes to the sustainability of the firm.

Definition of *Firm Self-Sustainability*: The firm is in a situation of Self-sustainability when the shareholders retain, at least, all the economic worth that the firm has generated.

We can represent the condition when the investors retain, at least, all the productivity effect as:

$$K_0^{t+1}(r^{t+1} - r^t) \geq \tilde{w}^{tT} x^{t+1}[(Y_L/\tilde{X}_L) - 1]. \qquad (5)$$

Only one stakeholder, the investors, receives at least all the created value. The rest of the stakeholders (consumers, suppliers and labor) receive no benefit from the created value by the firm. If (5) it is a strict inequality, investors are not just capturing the value created through productivity growth, they are also capturing value transferred from consumers, suppliers and/or labor due to its capacity of influence. It describes the best result for the investors and consequently for the sustainability of the firm, although as Davis notes it is not economic progress because the distribution of value is not balanced.

After the review of the self-sustainability concept we introduce the concept of weak sustainability. We define:

Definition of *Weak Firm Sustainability*: The firm is in a situation of weak sustainability when the economic worth created by the firm is distributed to the investors as well as other (one or more) stakeholders groups.

Now the economic worth is distributed to one or more stakeholders and implies that the investors retain less worth than generated by the firm. Some other stakeholders are able to capture part of the economic worth. We can express this condition as:

$$\breve{w}^{tT}x^{t+1}[(Y_L/\breve{X}_L) - 1] > K_0^{t+1}(r^{t+1} - r^t) \geq 0. \qquad (6)$$

In this case investors receive less than all of the value generated by productivity growth, leaving some remaining value to be distributed to the remaining stakeholder groups.

When all the generated value is distributed among the stakeholder groups other than investors we reach a situation we call *metastable equilibrium of sustainability*. This situation is defined as:

Definition of *Metastable Equilibrium of Sustainability*: The firm is in a situation of metastable equilibrium of sustainability when all the economic value created by the firm is distributed to the remaining stakeholder groups excluding investors, so that

$$\breve{w}^{tT}x^{t+1}[(Y_L/\breve{X}_L) - 1] > 0, \text{ but } K_0^{t+1}(r^{t+1} - r^t) = 0. \qquad (7)$$

Metastable sustainability implies that investors do not receive any of the value created by the firm. All created value is distributed to one or more other stakeholder groups. This is the final situation before introducing the concept of alert sustainability, which we define as

Definition of *Alert Sustainability*: The firm is in a situation of alert sustainability when the economic value distributed to the remaining stakeholder groups excluding investors exceeds the value created by the firm, so that

$$\breve{w}^{tT}x^{t+1}[(Y_L/\breve{X}_L) - 1] > 0, \text{ but } K_0^{t+1}(r^{t+1} - r^t) < 0. \qquad (8)$$

It is worth noting that in a situation of alert sustainability the firm is still creating value, but investors do not receive any of this value. The sustainability of the firm is threatened. All value created by productivity growth is dissipated to other stakeholder groups. This is expected to be a transitory situation as the firm knows that it must react quickly to generate wealth from other sources (i.e. pushing down the prices of raw materials or increasing the prices of sold goods).

When discussing economic progress and its relation to the different types of sustainability, some relevant conclusions can be derived from the previous definitions of sustainability. When condition (5) of sustainability is satisfied there is no economic progress, following Davis, because the distribution of created value is not balanced. None of the stakeholder groups, except investors, receive any part of the created value. This closes the option for economic progress. It can also be seen that in the situation of metaestable equilibrium of sustainability and in alert sustainability there is no possibility for economic progress. In these situations, the investors are not part of the group that receives the economic value created by the firm.

The conclusion is totally different in the Weak Firm Sustainability scenario, which is the only one that opens the possibility to have economic progress in the sense of Davis. It occurs in a situation of pan-distribution where all the relevant groups of stakeholders are receiving a portion of the created value.

As a concluding remark, following Davis, and regarding the stakeholder theory and stakeholder management practice the following should be stated:

Remark: Economic Progress is only possible when the firm is in the situation of Weak Firm Sustainability.

To end this section it has to be said that the firm can be in the situation of Weak Sustainability due to its own decision when deciding the part of value to be distributed through prices or due to market or/and stakeholder influence.

6. Re-employment of resources

This section will deal with the need of quick re-employment after a productivity change that results in a release of resources. The consequences of the adjustment of

resources will be different depending whether the firm faces a situation of economic growth (upsizing) or a recession (downsizing). In any case it is worthwhile considering what Davis (1947:63) stated regarding re-employment and its rapidity. This statement is particularly relevant when human resources are involved.

> *Though the degree of re-employment required to maintain progress may vary with circumstances, it can be taken as a guide that a short period of idleness is to be preferred to a longer one. For the shorter the period, the less interruption to production, and the sooner the total output of all goods and services can be expanded as a result of resource savings made possible by increased efficiency, or at least restored to something like former levels where displacement has not been caused by increased efficiency. In addition, it means less social cost in terms of unemployment. Thus the emphasis in the study of the conditions of re-employment is on those conditions which affects the period of unemployment –the rapidity with the displaced factors of production again become employed*.

Following Davis re-employment is an inexcusable condition for economic progress. It is well known that re-employment of exceeding resources is not always easy and immediate as a consequence and the social cost impact is not negligible. Both scenarios, the upsizing and the downsizing will be analyzed in this section and their consequences for re-employment, particularly for the decisions that have to be taken by the firm in relation to the level of internal re-employment.

For simplicity of the exposition that follows we consider a firm with one output and one input (M=N=1) and a technology (T), in two different periods of time, t and t+1. Figure 7 reproduces the situation on the assumption of positive technical change ($T^t \subseteq T^{t+1}$). It shows an improvement in technology between period t and t+1. The technology improvement is consolidated as an increase of productivity meaning that it is possible to produce the same level of output (y) with less resources (x). Figure 7 shows an efficient firm with the production set (x^t, y^t) in period t and ($x_E{}^{t+1}$, y^{t+1}) in period t+1, where $x_E{}^{t+1} < x^t$ and $y^{t+1} = y^t$. In this case $Y_L/\breve{X}_L > 1$ with $Y_L = y^{t+1}/y^t = 1$ as $y^{t+1} = y^t$, and $\breve{X}_L = x_E{}^{t+1}/x^t < 1$ which implies positive economic worth, $\breve{w}^{tT}x^{t+1}[(Y_L/\breve{X}_L) - 1] > 0$. It is important to stress

that none of the restrictive assumptions of the example are necessary for the methodology presented in the previous section.

Let's assume that the firm taken as an example develops its activity in a growing economy. In this context it is expected that the demand and production of period t+1 will be higher than the previous one. Figure 7 represents this situation with the following possible sets of production (x_A^{t+1}, y_A^{t+1}) and (x_B^{t+1}, y_B^{t+1}) depending on the level of demand.

It is worthwhile to note that the expected impact of the reduction of resources by means of technical change ($x^t - x_E^{t+1}$) is minimized by the upsizing situation. In the first endpoint (A^{up}) the exceeding resources will be less than expected and corresponding to ($x^t - x_E^{t+1}$) > ($x^t - x_A^{t+1}$). This means that the social impact will be minimized by the increase of demand. The firm will be able to use the released resources inside the firm. Then the conclusion is the bigger the increase of demand, the less the social impact as the adjustment of human resources will be lower. In the second endpoint (B^{up}) there is no social impact as $x_B^{t+1} > x^t$, hence the contrary, the firm is able to contract more resources than previously used contributing to the absorption of unused resources of the whole economy and favoring the possibility of economic progress. Both situations clearly correspond with Davis's scenarios described in the condition for economic progress as "*sufficient re-employment of any resource saved by increased efficiency to expand total output*" (Davis, 1947,147). Thus, the described example fulfills two of the conditions of economic progress of Davis: (i) generation of economic worth through increase of productivity and (ii) reemployment of the exceeding resources. Under these premises we cannot guess any conclusion about the third condition of balanced distribution of the economic worth so we cannot confirm the economic progress, it can only be said that it is more likely as the first and second conditions of Davis are fulfilled.

Different aspects have to be considered when the same firm is introduced in a context of firm downsizing and contraction of the economy. The social consequences of the downsizing scenario are totally different than in upsizing. The set of production (x_C^{t+1}, y_C^{t+1}) describes this scenario graphically in Figure 7. Now, the reduction of resources has two different components to be considered. The first is derived from the increment of productivity ($x^t - x_E^{t+1}$) and the second due to less resources needed to manufacture the

output as the level of demand has decreased and the exceeding resources for this reason is $(x_E^{t+1} - x_C^{t+1})$.

The social impact will be deeper than in the upsizing scenario as the firm needs much less resources in t+1 $(x^t - x_C^{t+1}) > (x^t - x_E^{t+1})$ to produce a lower level of output. Focusing the attention on the observed endpoint (x_C^{t+1}, y_C^{t+1}) we realize that it will capture technical change and at the same time the decrease of demand. Therefore we note that economic worth will still be created as $yc^{t+1}/ x_C^{t+1} > y^t/x^t$ which implies a positive value of expression (3). Being coherent with what we have exposed it has to be assumed that this value could be captured by the shareholder or be distributed to other stakeholders as well. It is interesting to note that this generated value can still be distributed to stakeholder labor. It means that the workers that are still employed by the firm are likely to be receptors of the generated value if their salary increases. This creates a dual situation for stakeholder labor, part of them become unemployed and part of the workers receives better salaries.

6.1. Firm re-employment

It is possible to make operative the Davis *re-employment* concept applied to the firm. For this we need to recall the general situation with M outputs and N inputs defined in the methodological section 3. We have $y^{\mathcal{T}} = (y_1^{\mathcal{T}}, \dots, y_M^{\mathcal{T}})$ and $x^{\mathcal{T}} = (x_1^{\mathcal{T}}, \dots, x_l^{\mathcal{T}}, \dots, x_N^{\mathcal{T}})$, with $\mathcal{T}$ = t, t+1, where $x_l^{\mathcal{T}}$expresses the observed quantity of labor in period $\mathcal{T}$. Furthermore, we need to define a starting point which should be based on a specific behavior of the firm that is used as a benchmark. We have three logical possibilities: (i) maximization of profit, (ii) maximization of revenues and, (iii) minimization of cost. The option (i), profit maximization, is usual in the economic literature. However, the business literature is especially critical with this approach and it prefers to assume that the firm follows a cost or revenue strategy (Porter 1990).

The analysis that follows takes a behavior of cost minimization as a benchmark, but it is straightforward to adapt it to a situation of profit or revenue maximization. We have that $x_{CE}^{t+1}(y^{t+1}) = \{x_{1_{CE}}^{t+1}(y^{t+1}), \dots, x_{l_{CE}}^{t+1}(y^{t+1}), \dots, x_{N_{CE}}^{t+1}(y^{t+1})\}$ defines the cost efficient vector of inputs that produces the output vector y^{t+1} with the technology of period t+1; $x_{l_{CE}}^{t+1}(y^{t+1})$ and $x_{l_{CE}}^{t+1}(y^t)$ denote the cost minimizing quantities of labour to produce y^{t+1} and y^t respectively.

We can define the firm *re-employment effect* ($\Gamma_{\text{re-employment}}$) as:

$$\Gamma_{(\text{re-employment})} = \frac{x_l^{t+1}}{x_{l_{CE}}^{t+1}(y^t)} \ , \tag{9}$$

which is the ratio between the observed level of labour in period t+1 and the cost efficient quantity of labour to produce y^t with the technology of period t+1. In terms of the simplified situation of Figure 7, the numerator of (9) is defined by x_A^{t+1}, x_B^{t+1} or x_C^{t+1} and the denominator by x_E^{t+1}. It has to be said that Γ can take bigger values, equal to or less than 1. $\Gamma < 1$ expresses a downsizing situation and its importance is given by the departure from value one. With $\Gamma \geq 1$, the firm is contracting more workers or the same amount as the cost efficient firm needs to produce the previous level of production (period t). This result is possible in an upsizing and a downsizing situation.

We can extract additional information from the expression (9) as it can be rewritten as:

$$\Gamma_{\text{re-employment}} = \frac{x_l^{t+1}}{x_{l_{CE}}^{t+1}(y^{t+1})} \cdot \frac{x_{l_{CE}}^{t+1}(y^{t+1})}{x_{l_{CE}}^{t+1}(y^t)}, \tag{10}$$

where the first expression of the right hand side defines a *misallocation effect* and the second expression an *efficient re-employment effect*. The misallocation effect is defined by the ratio between the observed quantity of labour in period t+1 and the cost efficient quantity of labour needed in that period. The *misallocation effect* can take a value higher or equal to one. When $x_l^{t+1} > x_{l_{CE}}^{t+1}(y^{t+1})$, there is an excess of resources employed by the firm in t+1 in relation to the cost efficient quantity of labour needed. In Figure 7, we have identified the point D as a example of this inefficiency situation. Regarding the efficient re-employment effect in expression (10), it expresses the quantity of cost efficient labour that the firm is able to absorb in an upsizing situation or should be adjusted in a downsizing situation. A value higher than one expresses the first situation and lower than one the second. When there is no change in the firm's demand, the efficient re-employment effect takes a value equal to one.

The re-employment effect is one of the expressions that explains the observed employment variation between period t and t+1. We have:

$$\frac{x_l^{t+1}}{x_l^t} = \frac{x_l^{t+1}}{x_{l_{CE}}^{t+1}(y^t)} \cdot \left[\frac{x_{l_{CE}}^{t+1}(y^t)}{x_{l_{CE}}^{t}(y^t)} \cdot \frac{x_{l_{CE}}^{t}(y^t)}{x_l^t}\right]$$

$$= \frac{x_{l_{CE}}^{t+1}(y^{t+1})}{x_{l_{CE}}^{t+1}(y^t)} \cdot \frac{x_{l_{CE}}^{t+1}(y^t)}{x_{l_{CE}}^{t}(y^t)} \cdot \left[\frac{x_l^{t+1}/x_{l_{CE}}^{t+1}(y^{t+1})}{x_l^t/x_{l_{CE}}^{t}(y^t)}\right], \qquad (11)$$

In the first equation three components explain the observed rate of employment change. The first expression of the right hand side is the *re-employment effect*, the second *the technical change effect* and the third the inverse of the *misallocation* effect in period t. The *technical change effect* is defined by the ratio between the cost efficient quantity of labour to produce the output vector y^t with the technology of period t+1, and the cost efficient quantity of labour to produce the same vector of output, with the technology of period t. This ratio measures the impact of technical change and can take a value higher, equal or lower than one. A value lower than one means positive technical change because less quantity of labour is needed to produce the same quantity of output. A value higher than one reflects decline, and no variation with a value equal to one. But, this ratio is also sensitive to substitution processes between inputs as a response to changes in the relationship of their prices.

In the second row of the equation (11) the re-employment effect is substituted by its decomposition given by (10). In this second row the observed employment variation is explained by the efficient re-employment effect, the technical change effect and the misallocation change effect. The *misallocation change effect* compares the misallocation of period t+1 with the misallocation of period t. When the misallocation of period t+1 is higher than period t, the misallocation change effect takes a value higher than one, lower than one when the misallocation of period t+1 is lower and equal to one with no variation.

7. Labor company stakeholder responsibility

The consequences of the human unemployed resources after a downsizing situation are devastating for the society. Conversely with the situation of economic growth, in a downsizing context of the economy no other sectors will be able to absorb the exceeding resources quickly. Therefore an undesired social situation will occur where the unemployed people cannot afford a new job. From the perspective of Davis there will not be economic progress despite the economic worth generated. The condition of quick

reemployment is not fulfilled as the unemployed resources cannot be contracted again by the productive sector. It is also worth mentioning that as a consequence of this recessive scenario a vicious cycle can be initiated where less output is necessary to be manufactured and as a consequence less people are needed by the firms. The list of unemployed grows and they find severe difficulties in rejoining the productive economy. In this context it is worth analyzing if the firm can be stakeholder responsible with labor in order to contribute to mitigate this vicious cycle.

For that reason we introduce into the discussion of this section the concept of company stakeholder responsibility applied to human resources. This company stakeholder responsibility can also be extended to a situation where the combined effect of productivity and demand generates a final quantity of labor lower that which was initially contracted. In Figure 7, the point (x_A^{t+1}, y_A^{t+1}) reflects this situation, where $x_A^{t+1} < x^t$. We analyze what would happen regarding economic progress if the firm decides, during a certain period of time, to accept using more human resources that the efficient quantity needed.

The relevant questions are about whether the firm has to or should be forced to cooperate in the minimization of the social cost of unemployment being "socially inefficient" or "socially responsible" in the sense of being stakeholder responsible with labor. First, it has to be answered if this behavior is sustainable? Where is the limit of stakeholder responsibility that the firm could/should achieve to reduce the impact of unemployment? We study these questions connecting this stakeholder responsibility behavior with firm survival.

The decision of giving up resources which exceed efficient level will be exchanged by a stakeholder responsible decision which is to maintain a certain quantity of human resources that are not strictly necessary. This decision will be inefficient from the point of view of the firm generating a higher cost. However it is expected that it will have a positive social impact when it avoids the uncontrolled increase of unemployed people and its related costs. The advantage for the firm is that the workers will remain in the company, trained and active, waiting for the change of the economic cycle. Then the firm will be prepared when the economic growth starts again. When this change occurs the real positive compensation for the firm will be a quicker and stronger reaction resulting in a competitive advantage over the non-stakeholder responsible firm. The latter will have to hire untrained and under skilled people and additionally spend time and resources to train them in order to be efficient again. They will need time to be as productive as the firm with skilled

people. The stakeholder responsible company behaviour is intended to create less tension in the labour market and speed up the recovery of the economy and economic progress when the economic conjuncture changes.

Coming back to Figure 7 we analyze the impact and consequences of the stakeholder responsible policy. We note that there are some hurdles to be overcome by the firm. We remind you that the firm has to be competitive in the market where it is operating. This is a necessary condition in order to avoid being expelled from of the market by firms with superior cost structure that can fix prices below the cost of the stakeholder responsible firm. Henceforth the sub index *CE* will define a cost efficient behaviour of firm *j*. The unitary cost efficient of firm j, in period t+1, can be defined as $uc_{CE_j}^{t+1} = (w^{t+1}x_{CE_j}^{t+1})/y^{t+1}$, where the price of the input w^{t+1} is given. The unitary cost of a stakeholder responsible firm *i* that uses more resources for achieving the same output would be $uc_i^{t+1} = (w^{t+1}x_i^{t+1})/y^{t+1}$. As $x_i^{t+1} > x_{CE_j}^{t+1}$, then $uc_i^{t+1} > uc_{CE_j}^{t+1}$. When they compete the cost efficient firm *j* is able to fix prices p_j^{t+1} in a way that $uc_{CE_j}^{t+1} \leq p_j^{t+1} \leq uc_i^{t+1}$. In that case the stakeholder responsible firm *i* is not expected to survive in the market as its unitary cost is greater than the price fixed by the cost efficient firm *j*. This means that all the workers employed in the stakeholder responsible firm will become unemployed in the short and medium run. This is a result which is contrary to the idea of economic progress and, of course, it means that the stakeholder responsible behavior is not sustainable through time.

Thus, to be competitive the stakeholder responsible firm has to compensate the additional costs if the firm wants to survive in the market. It has to maintain the same level of unitary cost despite the extra resources employed. The quantity to be compensated is at least the difference between the unitary cost of the stakeholder responsible firm *i* and the price fixed by the cost efficient firm *j* as $uc_i^{t+1} - p_j^{t+1}$. We expect that the competition in the market will bring the price of the product equal to the minimum unitary cost. Thus, the cost efficient firm *j* fixes the price $p_j^{t+1} = uc_{CE_j}^{t+1}$ and then the quantity to be compensated by the stakeholder responsible firm *i* is $uc_i^{t+1} - uc_{CE_j}^{t+1}$.

The stakeholder responsible firm has to find mechanisms of compensation in order to maintain the competitiveness. If there are no compensating mechanisms available the quantity of resources must be equal and cost efficient for both firms, and, consequently, their unitary cost. As a result, the firm cannot implement stakeholder responsible policies.

We compare the unitary costs defined by the difference: $uc_i^{t+1} - uc_{CE_j}^{t+1}$, in order to know the total amount to be compensated by the stakeholder responsible firm. Following Grifell-Tatjé & Lovell (2014), we consider $z_i^{t+1} = x_i^{t+1}/y^{t+1}$ and $z_{CE_j}^{t+1} = x_{CE_j}^{t+1}/y^{t+1}$ and the price of the input, w^{t+1}, may be different for firms *i* and *j*. Comparing the unitary costs we obtain

$$uc_i^{t+1} - uc_{CE_j}^{t+1} = w_i^{t+1} z_i^{t+1} - w_j^{t+1} z_{CE_j}^{t+1}$$

$$= w_j^{t+1}(z_i^{t+1} - z_{CE_j}^{t+1}) + z_i^{t+1}(w_i^{t+1} - w_j^{t+1}), \qquad (12)$$

which can be rewritten as

$$uc_i^{t+1} - uc_{CE_j}^{t+1} = w_j^{t+1} z_i^{t+1} \left[\frac{w_i^{t+1}}{w_j^{t+1}} - \frac{x_{CE_j}^{t+1}}{x_i^{t+1}} \right]. \qquad (13)$$

We can establish now the condition under which the unitary costs are equal. This means that the expression in brackets in (13) should be equal to zero. The price that should be paid by the stakeholder responsible firm is $w_i^{t+1} = w_j^{t+1}\theta_i^{t+1}$, where $\theta_i^{t+1} = x_{CE_j}^{t+1}/x_i^{t+1} \leq 1$ this parameter θ_i expresses the degree of inefficiency assumed by the stakeholder responsible firm *i*.

As a result, taking into consideration that the stakeholder responsible decision of contracting more workers than necessary implies $x_i^{t+1} > x_{CE_j}^{t+1}$, we can conclude, using expression (13) that $w_i^{t+1} < w_j^{t+1}$ as $w_i^{t+1} = w_j^{t+1}\theta_i^{t+1}$. This result shows that only the reduction of the price of the input factor, as a compensating mechanism, is able to make equal the unitary cost of both firms. The price w_i must be exactly adjusted by the level of inefficiency θ_i assumed by the stakeholder responsible firm *i*.

8. Compensation mechanisms

In this section it is investigated if generalizing the simple example of the previous section the stakeholder responsible firm has another mechanism of compensation than the reduction of input prices. We anticipate that there is not an alternative way. But, before proceeding, we have to consider the situation where the firm translates the social

inefficiency to higher output prices. It is worth recalling that we have excluded the possibility that firms create economic value through higher prices except when this increase is related to better quality of goods. Thus, the willingness to pay higher prices for equivalent products is not considered as a source of economic worth. We have to mention that it is not clear that consumers would be willing to pay more for equivalent products only for the reason they are produced by a company stakeholder responsible with human resources. It is only an economic transference from customers to firm in order to support the responsibility of the firm over one of its stakeholders, the labour force. In this case, the compensation mechanism is the higher prices of products. But, in fact, when it happens the firm is not increasing its contribution to the generated worth. It is only using a different kind of influence over the customers that results in additional rents from them.

There is no another possible mechanism than the reduction in input prices. We draw this conclusion with the help of Figure 8, which shows a situation with two inputs x = (x_l, x_1), one of them labour, and an output vector (y). It can be easily generalized to multiple inputs as we will do later. In Figure 8, the set of input vectors that are feasible for any given y is the input set L(y), which is bounded below by the input isoquant IL(y). The total cost of production (C) of the cost efficient firm *j* is $C_{CE_j} = w^T x_{CE_j}$ and the total cost of the stakeholder responsible firm *i* is $C_i = w^T x_i$, the price vector w = (w_l, w_1) is considered the same for both firms.

In Figure 8, the firm *j* is represented by the point A and it is producing at minimum cost. We consider the increase of employees in the stakeholder responsible firm *i* as $x_{l_i} > x_{l_{CE_j}}$, the point B in the figure expresses this situation. It is easy to realize that the costs of the stakeholder responsible firm are higher than the efficient firm as $w^T x_i > w^T x_{CE_j}$. This situation is expressed in the Figure 8 by comparing the dotted line $w^T x_{CE_j}$ with the line $w^T x_i$. This higher cost remains true despite the attempt of stakeholder responsible firm *i* to use the non-related labour factor more efficiently when reducing x_{1_i} to $x^1_{1_i}$, the point C in Figure 8. Consequently the firm is increasing the partial productivity of this factor and, additionally, it is technically efficient. The cost is reduced, but it is still higher than the cost of the cost efficient firm as it is shown in Figure 8. The stakeholder responsible firm *i* can only have the same total cost as the cost efficient firm at point D. It means using less quantity of the non-related labour input to the level $x^2_{1_i} < x^1_{1_i}$. But this combination of factors (x_{l_i},$x^2_{1_i}$) which defines the point D, is not achievable with the current technology

L(y). Despite the efficient adjustment of the non-related labour input a certain loss of allocative efficiency is still pending to be compensated. As we have seen in the previous simpler example the only remaining adjustment mechanism is the input prices. As a consequence, the equation (13) can be generalized to any amount of outputs and inputs (Grifell-Tatjé and Lovell, 2014) and rewritten as

$$uc_i^{t+1} - uc_{CE_j}^{t+1} = w_j^{t+1,T} z_i^{t+1} \left[\frac{z_i^{t+1,T} w_i^{t+1}}{z_i^{t+1,T} w_j^{t+1}} - \frac{w_j^{t+1,T} z_{CE_j}^{t+1}}{w_j^{t+1,T} z_i^{t+1}} \right]$$

$$= \sum_{h=1}^{N} w_{jh}^{t+1} z_{ih}^{t+1} \left[\frac{w_{ih}^{t+1}}{w_{jh}^{t+1}} - \frac{z_{CE_{jh}}^{t+1}}{z_{ih}^{t+1}} \right], \qquad (15)$$

where $z_i = \{x_{1i}/Y_i, \dots, x_{Ni}/Y_i\}$ and $z_{CE_j} = \{x_{1CE_j}/Y_j, \dots, x_{NCE_j}/Y_j\}$ with Y_i and Y_j defining an output level for firm i and j respectively (Eichhorn and Voeller 1976). The right hand side of the first row of expression (15) is the generalization of expression (13) for the case of multiple inputs and outputs. The second row shows that the difference in the unitary cost between the two firms is equal to the sum of the results from the direct comparison between their partial productivities and input prices.

Based on the first row of equation (15), It can be easily demonstrated that when trying to maintain the unitary cost of firm *i* and *j* at the same level a price adjustment mechanism has to be used. As a result of the stakeholder responsible behaviour $w_j^{t+1,T} z_i^{t+1} > w_j^{t+1,T} z_{CE_j}^{t+1}$ and then the only way to compensate the disequilibrium created by the extra resources used by firm *i* is to pay less for the inputs. Therefore, from the first row of expression (15), it has to be fulfilled

$$z_i^{t+1,T} w_i^{t+1} = \left[\frac{w_j^{t+1,T} z_{CE_j}^{t+1}}{w_j^{t+1,T} z_i^{t+1}} \right] (z_i^{t+1,T} w_j^{t+1}) = \theta_i^{t+1} (z_i^{t+1,T} w_j^{t+1}), \qquad (16)$$

where $(w_j^{t+1,T} z_{CE_j}^{t+1} / w_j^{t+1,T} z_i^{t+1}) = \theta_i^{t+1} < 1$. This means that at least one of the prices of productive factors of stakeholder responsible firm *i* has to be lower than the corresponding price of cost efficient firm *j*. It is interesting to note that expression (16) does not exclude the possibility that some other prices are also simultaneously incremented by firm *i*. It has to be said that when this happens the price or prices that participate in the compensation

mechanism have to support a bigger reduction in order to obtain the same unitary cost as the cost efficient firm. As a result, we can state the following conclusion:

Conclusion*:* Only the price compensation mechanism is able to maintain the competitiveness of the stakeholder responsible firm. The input prices have to be diminished accordingly with its lower level of allocative efficiency.

The question is which price or prices should be lower. Different options can be considered as price compensation mechanism depending on whom is assuming the load of the adjustment. In order to compensate the extra resources maintained by the stakeholder responsible firm it is necessary that one or more stakeholders assume the responsibility of being part of the pricing compensating mechanism reducing the prices they obtain and consequently their compensation.

As a framework of this discussion we use the second row of expression (15) where the effect of price variation related to each stakeholder group can be easily assessed. On the one hand we have to take into consideration the adjustment related to making the unitary costs of firm *i* and *j* equal. On the other hand we need to add to the analysis that the behaviour of the stakeholder responsible firm should allow the fulfilment of economic progress conditions.

The following alternatives have to be considered:

i) the cost of the compensation mechanism is fully assumed by the stakeholder labor

ii) the cost is assumed by the shareholder

iii) the cost is transferred to the suppliers

iv) a combination of previous options

Let's start the analysis with the first option hypothesizing that the stakeholder responsible firm, despite its assumed inefficiency, is still creating economic value. This supposition enables the first condition of economic progress and additionally enables that stakeholder labor can capture part of this value. Still, the salary in firm *i* has to be reduced compared to cost efficient firm *j*. Davis (1947,127) recognized the existence of this mechanism stating "*that the less efficient plants would have a lower wage scale than more efficient*". But, the reduction is lower than its level of allocative inefficiency. This result can be seen with the help of Figure 8, where the point C shows that the partial productivity

of inputs other than labour are bigger for the stakeholder responsible firm *i* than for cost efficient firm *j* i.e. $z_{il}^{t+1} > z_{CE_{jl}}^{t+1}$, but $z_{ih}^{t+1} < z_{CE_{jh}}^{t+1}$ $h \neq l$. Rewritten the second row of expression (15), isolating the factor related to labour, will obtain:

$$uc_i^{t+1} - uc_{CE_j}^{t+1} = w_{jl}^{t+1} z_{il}^{t+1} \left[\frac{w_{il}^{t+1}}{w_{jl}^{t+1}} - \frac{z_{CE_{jl}}^{t+1}}{z_{il}^{t+1}} \right] + \sum_{h \neq l} w_{jh}^{t+1} z_{ih}^{t+1} \left[\frac{w_{ih}^{t+1}}{w_{jh}^{t+1}} - \frac{z_{CE_{jh}}^{t+1}}{z_{ih}^{t+1}} \right], \quad (17)$$

where the second expression of the right hand side of (17) is negative when all the prices, excluded the price of input labour, are equal ($w_{ih} = w_{jh}$ si $h \neq l$). This implies that the reduction in the remuneration of labour is less than the inefficiency caused by the additional quantity of contracted workers. We have:

$$\frac{z_{CE_{jl}}^{t+1}}{z_{il}^{t+1}} w_{jl}^{t+1} < w_{il}^{t+1} < w_{jl}^{t+1}, \quad (18)$$

where the price of labour of the stakeholder firm is lower than the cost efficient firm, but higher than the adjusted price by the level of allocative inefficiency.

In the situation described in expression (18), the salary in the stakeholder responsible firm *i* can still be higher in time t+1 than in time t. The condition $w_{il}^{t+1} > w_{il}^{t}$ assures the capture of value by stakeholder labor. Conversely whether the price reduction results in $w_{il}^{t+1} \leq w_{il}^{t}$ the economic progress is not possible because the necessary condition of "weak balanced distribution" is not fulfilled. This condition represents an important additional restriction for the behavior of the stakeholder responsible firm limiting the number of employees that can be maintained in the firm.

Let's continue with the analysis of the second situation when the shareholders are assuming by themselves the cost of stakeholder responsibility. In that case shareholders will receive less return of their investment than the shareholders of a cost efficient firm. Again the necessary condition for achieving economic progress demands that they still capture value. If the return in time t+1 is inferior to the return in time t economic progress is not possible.

In the third option we assume the firm is able to transfer to the suppliers the cost of the stakeholder responsibility. In that case the price of supplier inputs are lower in the stakeholder responsible firm than in the cost efficient firm. Economic progress is not feasible if the supplier prices of the stakeholder responsible firm in time t+1 are lower than

the prices that the cost efficient firm in time t obtain. This is because these suppliers as stakeholder are not able to receive any part of the generated worth.

The three previous scenarios are expected to have opposition from the corresponding affected stakeholder. It will be really difficult for the workers, stockholders or suppliers to accept that all load of the adjustment by themselves, although the stakeholder labor is the only beneficiary. It seems more reasonable, for the sake of economic progress that all the stakeholders involved contribute in a balanced manner to the adjustment as all of them will receive part of the benefit of the economic progress.

9. Conclusion

H.S. Davis's contributions to the economic progress and stakeholder theory have not been considered for almost 70 years. Our analysis has demonstrated that Davis's ideas are compatible with the stakeholder theory concepts. Most of them are present in his contribution from 1947 and matches the central concepts of the theory.

Regarding the conditions for achieving economic progress it has to be said that Davis proposed that it depends on the capacity of the firms to create value. For him value creation is a consequence of the increases of productivity. When the firm contributes to value creation the participants (stakeholders) are able to capture part of this value. If the capture is balanced, in the sense that any stakeholder is able to capture value, the second condition for achieving economic progress is fulfilled. Finally, the resources that are released after the productivity change have to be quickly re-employed. We consider that economic progress is strongly related to the behaviour of the firms.

Davis's view of economic progress applied to a single firm lead us to the following conclusions:

1. The firm, as engine of value creation, has to be sustainable. It has to be able to create value through productivity and it shall retain part of it but not all. A part shall be distributed to stakeholders.
2. Distribution to stakeholders of the created value has to be balanced in the sense that all the stakeholders have to able to capture part of the value created. We use a weak definition of balanced distribution only requiring that they receive a part without defining the percentage. This capture is executed through prices.
3. Re-employment of resources is an inexcusable condition for economic progress. Depending on the general economic situation (i.e. downsizing) it could be acceptable that the firm maintains a social inefficiency, for instance maintaining more contracted workers than strictly necessary. It is considered to be an exercise of stakeholder responsibility. The firms that apply this policy are considered stakeholder responsible firms. To apply this policy a compensation mechanism through prices shall be applied. This is the only existing mechanism of compensation. This means that the firm can still compete against the cost efficient firm but the stakeholders have to accept (or be forced into) a reduction in their percentage of captured value. The capacity of influence of the firm and

the behaviour of firm and stakeholders will be the key factor to allow economic progress.

The part of the resources that are not maintained in the firm have to be quickly re-employed in other sectors of the economy. This opens the option for the regulator to favour with the appropriate policies the possibility of the horizontal displacement of the work force.

4. All the previous actions have to be executed avoiding wasteful or unsocial behaviours.

Summarizing Davis's thoughts opens new views on the relationship between firm and stakeholders, and about the objectives of the organization have to be and how all of them have to use their capacity of influence in order to achieve economic progress. Of course, this common objective is conditioned to the particular approach of any of the economic agents involved in this kind of equilibrium. When any of them is willing to use its capacity of influence to jeopardize the value created, the society is not able to achieve economic progress.

Davis did not define the concept of balanced distribution. It seems to us that it is one of the topics for further research. As the relationships among stakeholders are not symmetric and their relative positions regarding their capacity of influence are changing through time it is expected that a general rule for a balanced distribution does not exist. From our point of view it can only be expected that the analysis of value creation and its distribution is an indirect reflection of the capacity of influence of the firm and each stakeholder. As we have stated, since the beginning of this thesis, the stakeholder theory is about how the firm influence the stakeholders and how the stakeholders influence the firm in order to achieve their objectives.

10. Appendix E. Tables and Figures

Figure 7. Technical change with an increase of productivity in a upsizing and downsizing situation

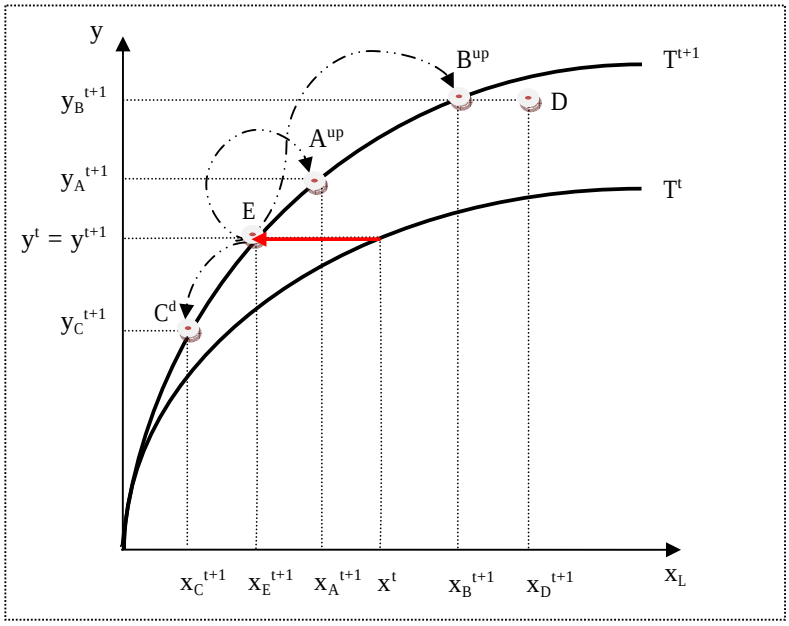
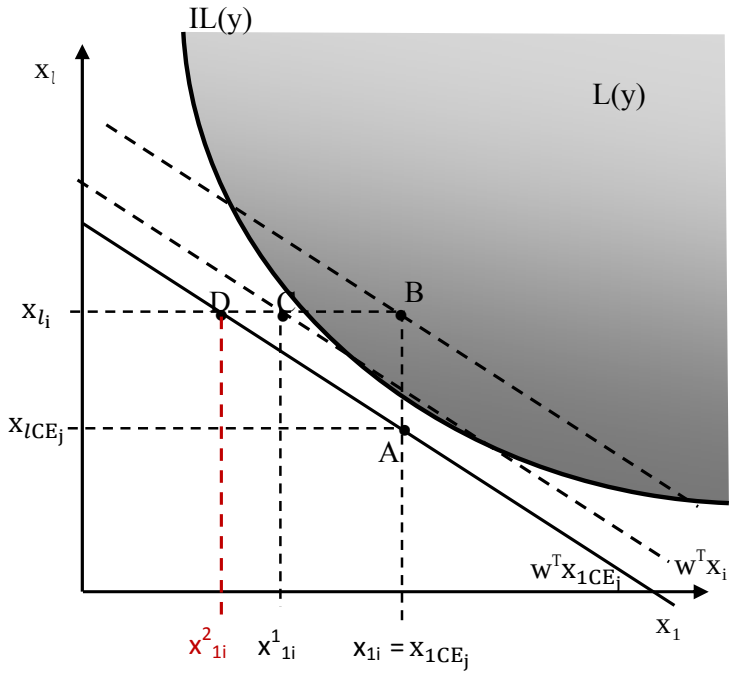


Figure 8. Compensating mechanism. Partial productivity



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Notes

[xi] The Industrial Research Unit of the Wharton School of the University of Pennsylvania was founded in 1921 as the Industrial Research Department with a mission to "study the economic and social problems of business." Sponsored by the Trustees of the University and financially assisted by the Carnegie Corporation, the Department worked in close relationship with a group of representative Philadelphia firms, which furnished data for research and analysis. (in http://www.archives.upenn.edu/faids/upb/upb5/upb5_9ir.html#ref2085) accessed May 10, 2014

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[xii] "Code of Fair Competition for wool Textile Industry" (Gardiner and Davis 1933), Production and Equipment Trends in American Worsted Yarn Manufacture, 1919-1932, (Davis and Brown, 1933), Textile Markets, Their Structure in Relation to Price Research, (Kennedy and Davis 1939), Inventory Policies in the Textile Industries series (Davis 1941), Wool and the War (Davis 1942), Economic Issues in Textiles (Davis, 1945) in http://www.archives.upenn.edu/faids/upb/upb5/upb5_9ir.html accessed May 10, 2014.

[xiii] Perrini and Tencari (2006) note that a company creates value when it adopts a managerial approach which is sustainability oriented. A company oriented in that sense is the one that develops itself over time by taking into consideration the economic, social and environmental dimensions of its processes and performance. In this perspective, value creation processes are broad and shared and meet, in different ways, the stakeholder expectations. Figge and Schaltegger (2000) outlined that is possible to make a shift in the generally adopted notion of value by introducing the concept of stakeholder value. Thus the sustainability of a firm depends on the sustainability of its stakeholder relationships. It should be considered not only shareholders, employees and clients. It should be added the suppliers, financial partners, local, national or multinational public authorities according firm's size, community and civil society in general (Perrini and Tencari 2006). They suggested that by adopting this stakeholder view means rethinking the nature and purpose of the firm. In this relational view of the firm the success of managerial efforts cannot be measured according a shareholder perspective, but only by adopting a more holistic and comprehensive stakeholder framework.

[xiv] To understand if the firm and stakeholder relationship is sustainable we need to be able to recognize after the analysis if the firm is performing like a firm optimizer, stakeholder optimizer or conversely it is being optimized the complete system at the same time in order to be sustainable. It is interesting to note looking the system from the point of view of the firm (Wheeler, Colbert and Freeman 2003) that it could be distinguished three levels of corporate culture with respect to organizational attitudes to stakeholders and the creation of value:

- "Compliance culture". The organizational unit is not specially engaged with its stakeholders but where basic societal norms are respected and thus the organization seeks to avoid the destruction of economic, social or ecological value.

- "Relationship management culture". The organization recognizes the instrumental value of good relations with immediate stakeholders (customers, workers, communities and business partners) and seeks to provide what value is appropriate in each case, within the limits of what is possible and usually after demands of investors are satisfied.

- "Sustainable organization" culture. The organization recognizes the interdependencies and synergies between the firm and its stakeholders. Seeks to maximize the creation of value simultaneously in economic, social and ecological terms.

Each of these three levels represent a different "stakeholder approach" and can be correlated with different definitions of corporate social responsibility going from the idea of "everything should be legislated" (corresponding to the first level) to the concept derived of a depth understanding of the nature of value for the firm and its stakeholders (third level). The authors also coined the "value-based networks" to acknowledge that stakeholders are sometimes grouped in key networks with a common sense of what is valuable. The process of defining value is fundamentally pluralistic and iterative and the business firm is a key player in the construction of what we may one day recognize as a viable, sustainable society. These observations have potentially profound implications for the nature of business (Wheeler, Colbert and Freeman 2003).

[xv] Within the stakeholder theory, as Donaldson and Preston (1995), Clarkson (1995), Post, Preston and Sachs (2002) stated a company can last over time if it is able to build and maintain sustainable and durable relationships with all members of its stakeholder network. Post, Preston and Sachs, (2002) noted these relationships are essential assets that managers must manage and they are ultimate sources of organizational wealth.

[xvi] The concept of corporate sustainability has been defined as "the capability of an organization to continue its activities indefinitely, having taken due account of their impact on natural, social and human capitals" (AccountAbility 1999:94). When transposing this idea of sustainability to the business level can also accordingly be defined as meeting the needs of a firm's primary and secondary stakeholders without compromising its ability to meet the needs of future stakeholders as well (Dyllick and Hockerts 2002). Bebbington (2001) revised the accounting literature to check if sustainable development concept was used in a way which equates with "good environmental management" and realized that the international development literature using sustainable development was addressing the question about what kind of economic system would lead to everyone's need being met in an environmentally sustainable society and socially just society.

[xvii] Summarizing they concluded that there is:

i) no consensus about what constitutes the sustainability objective
ii) differentiation of the efficiency and equity concepts is needed and the need to maintain this distinction when analyzing issues related to the long-term economic progress and the natural environment,
iii) economic analytic framework contains presumptions about the prospects for both resource-augmenting technical innovation and resource substitution but the empirical foundation underneath the assumptions is not as strong as it could be

iv) the dearth of empirical work on what sustainability might mean for economic and environmental valuations and the continued lack of concrete understanding of what "sustainability policies" might entail in practice.

[xviii] Cited by Davis (1947: 5)

[xix] A long debate has been running in the literature about the need of implementing social responsible behavior of the firm. The "whether", "why" and the "performance" regarding *Corporate Social Responsibility* have been studied. A recent review of the current economic perspectives on *Corporate Social Responsibility* can be found on Kitzmueller and Shimshack (2012).