

The role of formal capital budgeting analysis in corporate investment decision-making: a literature review

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Abstract

According to mainstream energy economics, energy-efficiency investment decisions made by businesses are strictly based on capital budgeting analysis. As a result, these investments are not decided upon because they are profitable only in appearance, since several hidden and transaction costs, as well as a high level of risk, lower their profitability below a firm's cost of capital.

It is curious that the energy-economics literature hasn't explored important questions discussed for several years by some finance research: do financial factors and capital budgeting tools really determine investment decisions? Does the investment type influence the decision-making process and the final decision?

Different streams of literature – organizational finance, strategic decision-making, technology investment analysis – have discussed these questions to improve our understanding of how capital budgeting systems work and have evolved. Several empirical studies have investigated the role of formal appraisal tools on capital investment decision-making. Their findings converge on the following conclusions: conventional financial analysis tools are widely used, and yet their real role is often secondary in investment decisions; sometimes they are simply used as a communication tool; the strategic character of investments has a heavier decisional weight. However, practices diverge with national cultures.

The goal of this paper is to review this literature, in order to escape the fruitless debate on energy-efficiency investments profitability as well as to highlight new ways to consider – and,

more importantly, to influence – decisions made in this regard. Ultimately, a better knowledge of corporate investment decision-making will enable the design of more effective public policies to promote corporate energy-efficiency investments, since the partial influence of financial factors and the importance of strategic factors in investment decisions entail several practical conclusions: first, improving investment profitability (through subventions or low-interest loans) is not sufficient to ensure a positive decision; secondly, information on profitability is not of much help either; thirdly, it is necessary to ascertain – and communicate about – the impact of energy-efficiency investments on a company's competitive advantage, or in other words, to highlight the strategic character of these investments.

Introduction

According to capital investment theory, any investment whose profitability is higher than the cost of capital for the potential investor should be decided upon and, when there is competition between investments, the one with the highest profitability should be decided upon. This theory has developed various analytical tools – known as capital budgeting tools – to evaluate investment profitability. Do real-world companies obey capital investment theory injunctions and use their capital budgeting tools to make investment decisions? The persistence of an “energy-efficiency gap” or, in other words, of an under-investment in profitable energy-technologies, casts doubt on that; but a debate is running between energy researchers regarding the reality and the causes of this energy-efficiency gap:

- According to mainstream energy economics literature, energy-efficiency investment decisions made by businesses are strictly based on capital budgeting analysis; financial considerations exclusively explain these decisions, which conform to capital finance theory. Energy-efficiency investments are not decided upon because they are profitable only in appearance, since several hidden and transaction costs, as well as a high level of risk, lower their profitability below a firm's cost of capital. The mainstream *credo* is that financial factors determine investment decision-making.
- Alternative literature on organizational behaviour regarding energy-efficiency investments has brought to light the fact that several factors other than financial strongly influence energy-efficiency investment decisions made by businesses. Certain organizational factors in particular seem to play an important role in this regard: organizational energy culture, power relationships, managers' interests and mindsets and, finally, characteristics of the investment itself, in particular its link with core business. The influence of these organizational factors *ipso facto* reduces the weight of financial factors on energy-efficiency investment decision-making. Therefore, according to the alternative stream, financial factors only partially determine investment decision-making.

The real issue at stake behind the debate on the drivers of energy-efficiency investments – and on the influence of financial factors on these decisions – is the validity of finance and economics theories in explaining economic agents' behaviour: if companies don't obey capital investment theory injunctions by not positively deciding upon profitable investments, then this theory can only have a normative – as opposed to explanatory – validity. Moreover, firms' behaviour would also challenge the validity of some fundamental neo-classical economics assumptions: rational behaviour of economic actors; profit maximization by firms; market efficiency. In this regard, it is interesting to note that energy efficiency is probably the only field (because *all businesses* consume energy in *all their operations*) in which businesses' behaviour challenges the validity of these theories so consistently. The importance of the stakes may explain the sharpness of the debate.

But this debate has remained centred mainly around the issue of energy-efficiency investment profitability: is it only apparent, or is it real? This is because the alternative literature on energy-efficiency investments lacks the theoretical grounds to explain its findings and, strangely, doesn't explore other research fields to look for their findings, compare their results and benefit from their possible explanations.

As a matter of fact, some finance and decision-making research does investigate the real role of financial factors and of capital budgeting tools on investment decisions; this research has also brought to light the influence of the strategic nature of an investment on the decision-making process and on its result (a positive, negative or no - decision).

The scope of this paper is to review this literature on the role and function(s) of financial factors and formal capital budgeting analysis in corporate investment decision-making, as well as on the importance of the strategic dimension of the investment, in order to escape the fruitless debate on energy-efficiency investments profitability and to highlight new ways

to consider decisions made in this regard. This literature review will be done in the second part of the paper, after a first part summarizing the main arguments of mainstream energy economics and the main findings of the alternative literature on energy-efficiency investments.

Energy-Efficiency Investments Literature

MAINSTREAM ENERGY LITERATURE: THEORETICAL STANCES

The theoretical framework which dominates energy-efficiency investment drivers' analyses is actually comprised of three different bodies of research which contradict each other somewhat:

- According to the finance approach based on capital investment theory, energy-efficiency investments are profitable only in appearance, as several hidden and transaction costs, as well as a high level of risk, lower their profitability below a firm's cost of capital.
- According to neo-classical energy economics approach, the so-called "market barriers" to energy-efficiency investments must rather be considered as "market failures", acknowledged by theory, which block pricing and price-transmission and thus prevent optimal behaviour of economic agents.
- According to the "extended" neo-classical economics framework (which includes agency theory and transaction cost economics, and has translated the concept of market failure in the organizational context), energy-efficiency investment profitability is not enough to engender a positive decision: these investments remain blocked by information problems which, combined with agents' cognitive limits (bounded rationality) and with their strong inclination to opportunism, prevent price indications from reaching decision-makers, or force organizations to define sub-optimal routines.

However, these three approaches all consider financial factors as the most important in explaining energy-efficiency investment decisions. For mainstream energy economists (among others Anderson and Newell, 2003; Golove and Eto, 1996; Jaffe and Stavins, 1994; Sorrel *et al.*, 2000; Sutherland, 1991; Van Soest and Bulte, 2001), negative investment decisions are due to a high level of risk (partially due to irreversibility of energy-efficiency investments) and a low real profitability (due to hidden and transaction costs and, sometimes, to the fact that energy savings may have been overestimated). Thus, for these economists, the energy-efficiency gap is not real: energy-saving investments are technically energy-efficient but economically inefficient. For instance, Anderson and Newell (2003, p. 23) state that: "*we do find evidence that there are likely many unmeasured costs and risks not captured in the IAC program's simple financial estimates, so that **estimated rates of return likely differ from realized rates of return***" [underlined by the authors]. This would explain why the profitability required for energy-efficiency investments is higher than the cost of capital

1. "A barrier is a postulated mechanism that inhibits investment in technologies that are both energy efficient and (apparently) economically efficient" (Sorrel *et al.*, 2000, p. 11).

for the investor (as described by Sorrel *et al.* 2000; DeCanio, 1993) or higher than that required for investments aiming at increasing production capacity (as discussed by Anderson and Newell, 2003; Kulakowski, 1999; Robinson, 1991). Mainstream economists therefore conclude that the assumption of firms' optimal behavior regarding energy-efficiency investments remains valid: within the framework of admitted market failures (mainly imperfect information), barriers in fact reveal a behavior 'indeed optimal from the point of view of energy users' (Jaffe & Stavins 1994, 805). As summarized by Sorrel *et al.* "the neglect of investment opportunities [is] a rational decision" (Sorrel *et al.*, 2000, p. 3).

This analysis is not satisfactory for several reasons: first, the rate of return for certain projects is such that none of the explanations provided can explain why potential investors reject them; secondly, the first step to reducing the energy-efficiency gap is a simple adjustment of existing equipment, which is achievable at a negligible monetary cost; thirdly, it does not explain the differences in behavior between similar firms operating in the same industry; fourthly, energy economists often mention the hidden cost but never the hidden benefits of energy-efficiency investments, although many such benefits, contrary to the hidden costs, have been estimated rather precisely (Jakob, 2006; Katz *et al.*, 2003; Mills and Rosenfeld, 1994; Pye and McKane, 1999; Worrell *et al.*, 2003).

One may also question the quality of financial calculations made by companies: "...organisations did not know how to assess the economic potential of their investments in energy efficiency. The weaknesses in the financial methodologies used by energy managers and estates departments for estimating the profitability of energy efficient criteria principally included making errors in the estimate of the inflation rate and changes to future fuel prices. The result of these errors was to render "many investment appraisal analyses meaningless" (BRECCSU, 1991, p. 6, quoted by Rigby, p. 15).

More profoundly, the financial approach analysis is flawed in two important aspects: first, one can't pretend that profitability is only apparent, when the costs (hidden and transaction costs) responsible for this situation are undemonstrable. Besides, it seems that these costs are not even taken into account by firms in their investments calculations (on this subject, see Sorrel *et al.*, 2000, p. 170). Secondly, payback time is the financial method most commonly used by firms as an acceptance rule for energy-efficiency investments. This means that the debate in the literature on the high rate of return required for energy-efficiency investments is artificial insofar as this rate is only implicit in the payback time method: when using this method, an investor's requirements bear on the timeframe necessary to recoup the initial spending and *not* on the investment profitability².

"ALTERNATIVE" ENERGY LITERATURE: EMPIRICAL FINDINGS

The mainstream approach is contested by several authors whose works comprise a heterogeneous alternative energy literature. Their work has shown that numerous factors influence energy-efficiency investments: organizational factors such as

size, geographical location, financial performance (DeCanio, 1998; DeCanio & Watkins, 1998; De Groot *et al.*, 2001), structure (Cebon, 1992), energy management system (Tunnessen, 2004), corporate energy culture (Sorrel, 2000; Kulakowski, 1999; Togeby, 1997; Cebon, 1992; Stern & Aronson, 1984; Henricke *et al.*, 1998), power relationships (Cebon, 1992; Sorrel, 2000); individual factors such as the existence and the skills of a manager responsible for energy issues in the organization (Rigby, 2002) or attitude towards energy (Stern, 1992); external factors such as energy prices. Some factors are of a structural kind (for instance, a more or less centralized decision-making), while others are more of a conjectural kind (for instance, a price change or a meeting between two actors as described by Cebon, 1992).

One factor in particular is often mentioned as playing an important role: the (absence of) link between an energy-efficiency investment and a company's core business (de Groot *et al.*, 2001; Harris *et al.*, 2000; Parker *et al.*, 2000; Sardanou, 2007; Sandberg and Söderström, 2003; Sorrel, 2000; Velthuisen, 1993; Weber, 2000; Weber 1997). Harris *et al.* (2000), in studying the factors driving energy-efficiency investment decisions of 100 Australian companies, mention that 35% of their respondents think that "energy efficiency is often overlooked by management, perhaps because it is not "core business" (Harris *et al.*, 2000, p. 874). In their research on energy-efficiency investment decisions made by 9 huge Swedish energy-intensive companies, Sandberg and Söderström note that "... profitability is far from being the only investment criterion, though it is very important", and that certain investments have not been decided upon because they were not core business (Sandberg and Söderström, 2003, p. 1627). In Sardanou's survey (2007) of the barriers to energy-efficiency investments, 60% of the managers interviewed mentioned as a first-rate barrier the fact that energy conservation is not a "core business activity". According to Sorrel *et al.* (2000, p. 45), companies "are found to economise on scarce cognitive resources. In organizations, this could mean focusing on core activities, such as the primary production process, rather than peripheral issues such as energy use". Velthuisen (1993) studied decisions made by 70 companies in 7 industries to identify the blocking and fostering factors to energy-efficiency investments. According to his results, "non-core business character" is one of the most important barriers to energy-efficiency investments³. Weber (1997, p. 834) hypothesizes that "barriers to energy efficiency in organisations may result from ... a trade-off with non energy-specific goals ...", which is confirmed by the results of his empirical research on the decisions having an impact on energy consumption in 100 Swiss office buildings between 1986 and 1996: out of the decisions taken, only 9% have a clear goal to reduce energy consumption, 14% take energy into consideration and 77% just don't consider their impact on energy consumption. Weber concludes that "energy is generally not an issue when energy-relevant decisions are taken" (Weber, 2000, p. 431) and that this is due to the lack of a link with core business. As Weber puts it: "Directors are generally not willing to invest in energy efficiency even if the investment is profitable.

2. For a good description of capital budgeting methods, I would advise the following reading: Harvard Business Essential (2002). Finance for Managers, Harvard Business School Press, Boston, MA.

3. The other major barriers identified by Velthuisen are "the small size of the energy bill, a limited knowledge, ..., equipment is not scrapped yet, and budgetary constraints are definitely reasons for not implementing" (Velthuisen, 1993, p. 11).

Directors tend to concentrate on the core business, in which domain they are knowledgeable and powerful [underscore added]. *Energy conservation measures are actually considered to be outside the scope of rent-seeking actions in firms, whether private or public sector*. Weber also notes that decisions made with a clear objective to reduce energy consumption are linked to the presence of an energy manager or to the fact that energy is directly managed by a manager of upper level. Similarly, De Groot *et al.* (2001) note that less than 10% of the investments made by Dutch energy-intensive companies specifically aim at reducing energy consumption, and that “*other existing investment opportunities*” is the second most important barrier (after information) to energy-efficiency investments. More important or promising investment opportunities are also mentioned as a barrier to energy-efficiency investments by 68% of the managers interviewed by Sardanou (2007). Finally, Parker *et al.* (2000) survey of the decisions made by owners of rental buildings or hotels is very useful insofar as it better describes this link between the importance of an investment for a company’s core business and the decision made: the primary reason for a positive decision is not the investment profitability but its impact on the apartment’s or hotel’s attractiveness. As described by Parker *et al.* (2000, pp. 8-9): “*tenant comfort was noted to be decision-makers to play a key role ... According to some, energy cost-saving measures might be passed over if they are perceived as posing an inconvenience to building tenants (or in the case of hotel, to guests), such as lighting sensors or after-hours HVAC⁴ controls... Perhaps our most striking findings is the extent to which tenant retention and attraction are important to building owners that lease their properties, and can sometimes be, as one respondent noted, “the number-one key” when making investment decisions. It should therefore be kept in mind that energy-efficiency upgrades can be viewed with favor as much for their ability to please tenants, as for their ability to reduce the firm’s own operating costs. Furthermore, other firms claimed that they will stretch their customary financial criteria* [underscore added] *to invest in low-performing measures, if they are requested by tenants*” (idem, p. 12).

Although there are many different definitions of strategy⁵, most authors in the field agree on the following basic elements: strategy sets out the *basic direction of the organization*, by specifying the organization’s *long-term activities and goals*, according to its *internal resources* and to *external factors*, in order to build a *durable competitive advantage* (Johnson & Scholes, 2000, p. 27). According to this definition, the primary goal of strategy is to obtain or develop a durable strategic advantage. And, as theorized by Michael Porter in the value chain concept (1985), core business activities are those that enable a firm to obtain a competitive advantage vis-à-vis its competitors, in proposing an attractive offer to its clients. Therefore, the fit with core business, mentioned by the authors of the alternative energy

4. Heating Ventilation Air-Conditioning.

5. “*Apparently, we are not even sure if we agree on the same definition of strategy. There is no lack of available definitions. Anyone with any claim to recognition in “the field” has provided one ... Yet all these definitions remain so vague and so general that they provide little help. Most of the definitions are either descriptive of the strategy-making process or tautological in nature, saying basically that strategy is the set of decisions that makes an organization successful, or strategy is what top managers do. Such a lack of clarity in the basic concept makes the search for meaningful research findings and hence theory construction difficult*” (Hafsi et Thomas, 2005, p. 507).

literature as an important investment decision-making criterion, is, in actual fact, describing the strategic dimension of an investment.

Altogether, the alternative research on organizations’ energy-efficiency investments depicts investment decisions as a complex process which results from the interaction of numerous factors. Among these factors, one of the most influential seems to be the link between the investment under consideration and a company’s core business or, in other words, its strategic fit. In any case, the high number of factors influencing energy-efficiency investment decisions *ipso facto* reduces the relative weight of financial factors on these decisions. This logical conclusion has been confirmed by De Groot *et al.* (2001): their research, conducted with 135 Dutch companies of 9 energy-intensive industries, has shown that insufficient profitability and access to financial resources are not the first barriers to energy-efficiency investments. This was also confirmed by my own research, on the drivers of energy-efficiency investments, conducted with 35 Geneva companies between June 2006 and June 2007, where I used the De Groot *et al.* questionnaire. As summarized by Robinson (1991, p. 634): “*the point is not that economic factors are irrelevant in explaining energy-use, but that they are insufficient...*”

However, authors of the alternative stream have generally not tried to integrate their findings into a theoretical framework or to compare their findings with those of other research fields. Yet some research in organizational finance, strategic decision-making, or technology investments, has also investigated the real role of financial factors and of strategic considerations on investment decision-making. The next section will describe the findings of these streams of literature.

Capital Investment Decision-Making Literature

Capital investment is little known, although it is a very important economic phenomenon. “Investment decision-making takes up a very small space in micro and macroeconomic theories”⁶ (Guerrien, 2002) as well as in empirical research. As noted by Jensen (1993, p. 870): “*The finance profession has concentrated on how capital investment decisions should be made, with little systematic study on how they actually are made in practice*”. Financiers envisage the investment from a strictly mechanical angle: evaluation, followed by decision. Most researchers in strategy don’t even discuss it. Companies reluctantly communicate about their investment policy. The term “investment” itself is rarely defined in the literature, although several approaches or definitions are possible.

According to the dominant financial-economic perspective, the purpose of an investment is to increase a company’s economic capacity and financial value. The strategic approach to investment proposes a more complex view: investing, in the language of strategy, is related to a company’s choices of development⁷. As expressed by De Bodt and Bouquin (2001), fol-

6. Freely translated by me from: “La décision d’investissement n’occupe ... qu’une place très faible dans les analyses théoriques [micro et macroéconomique]” (Guerrien, 2002).

7. Freely translated by me from: “Investir, dans le langage de la stratégie, renvoie à des choix de trajectoires de développement de l’entreprise (construire, s’implanter, conserver, se retirer d’un marché, absorber, s’allier, etc.)” (Desreumaux et Romelaer, 2001, p. 61)

lowing Bower (1970) and Klammer (1994): “we become aware of an interest to invest when we notice a gap between what should be and what is. The investment is an answer. What is the question? A recognizable ambition. Without strategy, without a direction, the emergence of good projects is unlikely to happen. The main part of the process lies in the identification of true problems⁸”.

Investment decisions are financial decisions but they are also, often, strategic decisions. Actually, most strategic decisions, because they translate into resource allocations, are investment decisions, or imply investment decisions⁹. Strategy and investments may influence each other: the implementation of an investment can open new possibilities which will influence strategy formulation. Sometimes a strategic direction develops precisely because an investment opportunity does exist. Therefore, a strategic approach on investment appears necessary to analyze investment projects as well as investment decisions.

In spite of the need for a multidisciplinary approach to analyze, or even prescribe, investment decision-making, the necessary integration of the two main languages of top management, finance and strategy, does not happen (Papadakis and Barwise, 1998, Shank, 1996). Compartmentalization between scientific domains is also the rule in this field, and the link between strategy and investment is rarely analyzed: researchers in the field of strategy show little interest in investment, and researchers in the field of finance show little interest in strategy. In this regard, Koenig (2001) notices that investment remains an “under-analyzed and peripheral object” in the field of strategy. His statement is based on a review of twenty-three textbooks on strategy, post-1980, which shows that the item “investment” appears in the index of only ten of them, and that only three textbooks out of twenty-three contain a real reflection on capital investment. In the field of corporate finance, textbooks generally devote only a few lines to describing the link between investment and strategy. Papadakis and Barwise report a significant anecdote on the academic ivory tower prevailing in the finance and strategy fields: “*Our original proposal was for a book on “strategic investment decisions” – to us, and most European researchers (e.g. Butler et al. 1991, Child and Lu 1996), much the same as SDs [Strategic Decisions], but excluding the small minority that do not involve any capital investment. The publisher liked our proposal but was unable to get it reviewed: the finance people said it was strategy (because of the s-word) while the strategy people said it was finance (because of the i-word). Once we dropped the i-word, all was well: “strategic decisions” clearly positions the book under the heading “strategy process”* (Papadakis et Barwise, 1998, p. 5). Compartmentalization is also the rule in the literature on energy-efficiency investments: most authors in the field only take into consideration financial factors to explain these investments; authors who do notice the influence of the relationship between core business and (no)-

decision haven’t investigated the link between the financial and strategic dimensions of investment decision-making.

One exception to the compartmentalization of finance and strategy can be found in the fields of cost accounting and of AMT (*Advanced Manufacturing Technologies*) investments, where certain researchers, observing the limits of financial evaluation tools to evaluate qualitative strategic investments, advocate a new approach to investments which would integrate their financial and strategic dimensions (Slagmulder *et al.*, 1995; Lefley, 1996; Putterill *et al.*, 1996; Shank, 1996; Adler, 2000). Some analytical tools have been proposed in this regard, most of them derived from strategic management: strategic cost management, value chain analysis, benchmarking, balance scorecard, SWOT (strengths-weaknesses-opportunities-threats) and the five forces of competition (Porter). However, with the exception of benchmarking, these tools remain little used by companies to complete their analysis of investment projects (Alkaraan and Northcott, 2006; Carr and Tomkins, 1996).

Thus, financial evaluation methods of investment projects dominate strategic evaluation methods. They are very widely used, as shown by the few empirical works written on this subject. An Alkaraan and Northcott study (2006), carried out in 2002-2003 with 83 huge British companies representing 8 different industries, highlights very high percentages in the use of financial evaluation tools: respectively 99%, 89% and 96% of the companies surveyed were using NVA (Net Present Value), IRR (Internal Rate of Return) and/or payback methods. The Alkaraan and Northcott study also shows that the use of these techniques is in progress, that the simultaneous use of several evaluation techniques is more and more frequent¹⁰ and that payback time is the first or second method used. These results are similar to those of Abdel-Kader and Dugdale (1998). On the other hand, they differ from those of Graham and Harvey (2001), whose survey, conducted with 392 American companies, has shown a less frequent use of traditional financial evaluation methods (NPV, IRR, payback time) and, among them, a superiority of NPV (used by 75% of the companies surveyed) and IRR (74%) on that of the payback time (57%). However, according to Graham and Harvey, “small” companies (those with a turnover smaller than \$US 100 mio) use the payback method almost as frequently as NVA/IRR. Alkaraan and Northcott, as well as Graham and Harvey, wonder at the payback method’s popularity, in spite of its defects often underlined by finance theory (the investment flows beyond the payback limit and the time value of money are not taken into account). According to Graham and Harvey, this popularity is explained by a lack of sophistication of companies and decision-makers, and not by budgetary constraints.

Several research studies bring to light the influence of national culture and corporate culture on the use and role of financial evaluation techniques. For example, with regard to investment decisions, Anglo-Saxon companies seem more “financially oriented” than German or Japanese companies, which are more “strategically oriented”: in the first case, the aim of investment is profitability; in the second, it is a strate-

8. Freely translated by me from: “On prend conscience de l’intérêt d’investir quand on constate un écart entre ce qui devrait être et ce qui est [...]. L’investissement est une réponse. Quelle est la question? Une ambition identifiable. Sans stratégie, sans projet connu, l’émergence de bons projets est rendue peu probable. C’est dans l’identification des vrais problèmes que réside l’essentiel du processus” (De Bodt et Bourquin, 2001, p. 127).

9. For instance, out of the twenty-five strategic decisions studied by Mintzberg, Raisinghani & Theoret (1976), twenty-two were investment decisions.

10. For every investment project, 98% of surveyed companies use more than one, and 88% more than two methods of evaluation.

gic goal such as a market share increase. Carr and Tomkins (1996) show that German companies make less use of financial evaluation methods than their British counterparts in the same industry, and with different requirements: average payback time is 5 years for German companies and 3,3 years for British companies, although companies' ownership also plays a role (unquoted British companies have payback times longer than quoted companies. Pezet (2002) describes the influence of corporate culture on Péchiney's investments.

Are financial evaluation techniques applied indistinctly to all investments, whether strategic or non-strategic? Alkaraan and Northcott (2006) answer this question positively. On the contrary, Carr and Tomkins (1996) have noticed a less frequent use of dynamic methods (such as NPV or IRR, which take into account the time value of money by using a discount rate) for strategic investments than for non-strategic investments in the companies sampled¹¹. This result could be linked to the Dean and Sharman research of 1993, which shows that the higher the strategic character of a decision, the lower the level of procedural rationality of the decision-making process¹². Although they don't distinguish between strategic and non-strategic investments, Graham and Harvey are surprised by the fact that about 60% of the companies surveyed apply the same discount rate ("company-wide discount rate") to all investment projects regardless of their particular risk level: this could be related to the quality of the financial calculations made by companies (see Rigby, 1991, p. 3).

The real influence of financial evaluation techniques is, however, not as important as their wide-spread use would lead one to think, and they even seem to often play a secondary role in investment choices. Indeed, several empirical studies (Bower, 1970; Hall, 1973; Butler *et al.*, 1993; Carr *et al.*, 1994) show that evaluation methods intervene rather late in the investment decision-making process, and rather as a control *ex ante* during the ratification phase. Mintzberg, Raisinghani and Theoret (1976) and Pezet (2002) make the same observation. Research also indicates that the use of these techniques is often partially diverted from their first vocation by serving goals other than decision-making support: for instance, Segelod (1997) puts in evidence the symbolic role of these procedures, rites actually serving to justify decisions already taken; in their survey of strategic investment processes in fifty banks and huge Belgian companies, Van Cauwenbergh *et al.* (1996) show that evaluation procedures serve not only as decision tools but also as communication tools, and that companies with the most financial leeway have less use of formal evaluation procedures. Jensen (1993) indicates that the financial theory rule specifying to adopt any investment with a positive NPV is far from being universally followed by decision-makers. Carr *et al.* (1994), Carr and Tomkins (1996) and Van Cauwenbergh *et al.* (1996) highlight the minimal real impact of formal analyses – whether financial or risk analyses – on strategic investment decision-making. Alkaraan and Northcott (2006) note that companies

11. Although these research results are not fully comparable: huge companies representing 8 industries, surveyed by mail in Alkaraan and Northcott research, small companies representing a single industry interviewed in Carr and Tomkins research.

12. Defined by Dean and Sharfman (1993, p. 589) as "the extent to which the decision process involves the collection of information relevant to the decision, and the reliance upon analysis of this information in making the choice."

seem to look for a balance between strategic criteria, mostly qualitative, and financial criteria, in their evaluation of investments projects. Finally, several research works bring into evidence the decisive role played by intuition and judgment in strategic investment decision-making (Alkaraan and Northcott, 2006; Carr and Tomkins, 1996; Mintzberg *et al.*, 1976; Van Cauwenbergh *et al.*, 1996), described in the following quote: "one Group Finance Director offers an insight into why it is that the "science" of evaluative technique is unlikely to ever supersede the "art" of strategic decision-making: "Intuition and judgment are absolutely crucial. You can't just take academic calculations and sit down and look at them and say they make sense... These decisions aren't just based on hard calculations – you have got to have a view of your company when you're talking to the people in it. So, intuition and experience are extremely important" (Alkaraan et Northcott, 2006, p. 168).

Alternatively, several empirical works have demonstrated the importance of strategic factors in decision-making and the link between investment decisions and a company's strategic goals (Alkaraan and Northcott, 2007, 2006; Burcher and Lee, 2000; Butler *et al.*, 1991; Carr and Tomkins, 1996; De Bodt and Bouquin, 2001; Maritan, 2001; Putterill *et al.*, 1996; Segelod, 1995; Van Cauwenbergh *et al.*, 1996). 93% of Alkaraan and Northcott (2006) survey respondents consider as "important" or "very important" investments concordance with their company strategy. Carr and Tomkins (1996) research shows that investments are analyzed by companies according to strategic considerations rather than according to their particular profitability. In her research on strategic investments made by a huge American pulp and paper company, Maritan (2001) reports that in this company, investment proposals have to specify the expected consequences of the investment on production capacity and on products and markets, and must describe the link between the investment considered and the strategy of the division concerned. This procedure is similar to those of twenty-nine important Swedish groups studied by Segelod (1995) who, by comparing investment manuals, notes that the investment link with strategy is one of the four decision-making criteria for all managers at group level (together with investment profitability, impact on financing and on coordination). Having compared strategic investments decision-making processes in three huge English companies, Butler *et al.* (1991, p. 402) note that "... product quality, fit with business strategy and improving the competitive position of the firm were the most important factors considered by all informants in all three companies".

Several studies also emphasize the quest for competitive advantage as the first goal of capital investments, which is another way to describe companies' requirement for the strategic fit¹³ of these investments. As part of an international research project on investment decisions in the manufacturing industry, a Burcher and Lee survey (2000), in line with Putterill *et al.* (1996), shows that obtaining/increasing competitive advantage is the first – strategic – motivation of an investment AMT (*Advanced Manufacturing Technologies*), before the expected financial profits. In their review of research on formal decision routines, De Bodt and Bouquin (2001) note that competi-

13. Since the primary goal of strategy is to obtain or develop a durable strategic advantage (as per the definition given above, see p. 4).

tiveness is the most important decision factor in a situation of uncertainty (which characterize strategic decisions) and that profitability plays a non-determining role in investment decision-making. A strong majority of the 44 companies surveyed in their research subscribe to the following assertions: “*One can always find money to finance a good project*” (33 companies out of 44); “profitability of an investment is not sufficient to entail a positive decision” (37 companies out of 44); “*Above all, a project must contribute to the realization of the company’s strategic goals*” (40 companies out of 44). Having used the De Bodt and Bouquin questionnaire for the financial part of my own 2006-2007 research on the drivers of energy-efficiency investments, I have obtained very similar results, as respectively 11, 15 and 16 managers out of 17 subscribed to the same assertions. Thus, the strategic character of an investment is important enough to block a profitable investment or, conversely, to boost a non-profitable one.

Altogether, this literature review of the respective influence of financial and strategic criteria on investment decision-making shows that the strategic character of an investment is the most important decision-making factor, even more important than profitability. Strategic investments are thus in a better position to win the competition existing between projects within organizations (theorized by Langley *et al.*, 1995). Regrettably, too little attention is dedicated by research to a comparative analysis of the evaluation methods for strategic and non-strategic investments, which could bring to light possible differences in treatment. In this regard, it would be interesting to investigate whether the payback method is more widely applied by companies to non-strategic investments, whereas the dynamic methods (NPV and IRR, which imply a longer time period), are applied to strategic investments. With regard to energy-efficiency investments, the payback method is by far the most widely used financial evaluation method.

Conclusion

Alternative energy literature and capital investment decision-making literature converge on the same conclusions: financial factors play only a partial, or even secondary, role in investment decisions; the strategic character of an investment seems to have more influence on decision-making than profitability. This explains why companies sometimes make negative decisions on profitable investments and, conversely, make positive decisions on non-profitable investments.

Financial factors and capital budgeting analysis do not determine investment decision-making, and companies do not obey capital investment theory injunctions. Therefore, capital investment theory has only a normative – as opposed to explanatory – validity. Moreover, the numerous organizational factors influencing investment decision-making (described by the alternative energy literature but also, while not discussed in this paper, addressed by the decision-making literature) challenge the explanatory validity of the two other theoretical frameworks dominating energy economics: the neo-classical economics framework and even the “extended” neo-classical economics framework, because the core concepts of agency theory and transaction cost economics – lack of information, bounded rationality and individual opportunism – are far from sufficient to explain corporate investment decision-making.

The partial influence of financial factors and the importance of strategic factors in investment decisions entail several practical conclusions for public policy programs aiming at promoting corporate energy-efficiency investments: first, improving investment profitability (through subventions or low interest loans) will not be sufficient to ensure a positive decision; secondly, information on profitability will not be of much help either; thirdly, it is necessary to ascertain – and communicate about – the potential impact of energy-efficiency investments on a company’s competitive advantage, or in other words, to highlight the strategic character of these investments.

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