Modelling the Cost-Benefits of Corporate Social Responsibility (CSR) for decision making in the Aviation Industry

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Abstract: Though intangible in nature, Corporate Social Responsibility (CSR) is increasingly becoming a necessary requirement for firms in the aviation industry. The aim of this paper is to analyze the Cost and Benefits (CB) of CSR investments and to find the point of convergence for prudent economic performance. The paper models the economic mechanisms behind CSR based on the microeconomic concept, thus a cost-benefit Analysis (CBA) for decision-makers in the aviation industry. The paper concludes that the microeconomic underpinnings of CBA provide an understanding of the mechanisms and incentives behind the behaviour of socially responsible firms in the aviation sector. It is revealed that, aside the intangible nature of CSR assets, the reason for the reluctance of many aviation firms to investment in CSR is the perceived imbalance between such investment (cost) and the revenue or direct profits derived by the firm. The implication of the analysis is that there should be an equilibrium investment point for CSR policies in order for aviation firms to be encouraged to invest in CSR projects.

Key-Words: cost-benefit analysis, Corporate Social Responsibility, intangible assets, aviation industry

1 Introduction
The corporate social responsibility (CSR) of firms in the aviation industry is an increasingly important topic in the global economy in general, and in the European Union in particular. The reporting of CSR as an intangible asset has a triple-bottom line approach in the assessment of the performance of a firm: economic/financial, environmental and social factors. A comprehensive assessment of a firm’s economic value includes the expansion of the financial reporting process by incorporating the valuation of not only the tangible assets, but also the intangibles and the intellectual assets. Conventional economic theory suggests that firms tend to maximize profits taking into consideration certain constraints. When there are no economic incentives like taxes or quantitative regulations, there is a tendency that the firm might pollute the environment too much, or engage in behaviour detrimental to the society.

Indeed, firms in the aviation industry spend many resources to convince current and potential consumers, regulatory bodies and other stakeholders that they are more socially responsible than what authorities or society demand. Regulatory bodies constantly formulate policies that are geared towards ensuring that firms in the aviation industry act responsibly and reduce or limit the extent of externalities (pollution) to the environment in the course of their operations. CSR in the aviation industry is necessary because the impact of airline operations on the environment, thus gas emissions and noise differs from other industries, hence, the CSR cost and the benefits that accrue to firms also differ. For firms in the aviation industry, the crux of the matter is how best to streamline their CSR initiatives to make them efficient without much impact on their bottom-line.

2 Aims and objectives
The aim of this paper is to analyse and model the economic mechanisms behind CSR based on the microeconomic concept, thus a cost benefit analysis (CBA) for decision making by managers of firms in the aviation industry. The reason for using the CBA is to provide an augmentative modelling of the interrelationship between the marginal benefits (MB) and marginal costs (MC), and to find the point of convergence for prudent economic/financial performance of firms in the aviation industry.

3 CSR in the aviation industry
The World Bank asserts that CSR “is a term describing a company’s obligations to be accountable to all of its stakeholders in all its operations and activities. Socially responsible firms consider the full scope of their impact on
communities and the environment when they are making decisions, balancing the needs of stakeholders with their need to make profit” [11]. CSR is considered to be actions that, to some degree, imply corporate beyond-compliance behaviour in the social and/or the environmental arena. The main driving force for firms to adopt CSR is the subsequent financial benefits [6]. Though the causality between the two remains unclear, empirical studies indicate a simultaneous relationship-interaction between CSR and financial performance [14].

The activities of aviation firms are associated with several social and economic benefits. However, in recent years, their activities have also significantly impacted the environment in terms of air pollution, noise pollution and global climate change [15]. There has been a need for firms in the aviation industry to develop an environmental agenda and take measures to reduce the ever-growing environmental impacts from their activities. In spite of the detrimental effects (pollution) of aviation, the global demand for air transport is forecast to grow at around 5% per year and thus will double in less than 15 years. The impact on the environment will be worth mentioning, as aircraft presently release approximately 3% of the global emissions of carbon dioxide and about 2% of nitrogen oxides from fossil fuels. This percentage is expected to increase rapidly if technology and policy initiatives remain unchanged [2].

The implementation of CSR initiatives both environmental and social is a significant approach in the aviation industry. Within the business model, addressing environmental and social concerns is no longer considered as a mere response to the regulators, and policy-makers, but rather as a proactive financial decision by the aviation firm. The dilemma faced by these firms is how to engage in CSR in the most cost-effective and profitable manner. Though environmental investments are hailed by society, they are not so attractive to firms in the aviation industry where the commitment towards CSR is generally low, although their operations account for a large part of the atmospheric pollution. The main reason is that an initial significant amount of money is required for investments in CSR, while the large part of those are treated as irreversible investments under output price uncertainty. Another major concern about CSR investments is the time frame in which the return on the initial investment is realized. Long-run return investments, such as the environmental ones, are less desirable for decision makers, because the aviation industry associates them with high risk.

Hence, there is a need for an optimization factor in the computation of the return on initial investment to make such investments more attractive.

A number of studies emphasized the problem of selecting appropriate models for measuring responsible corporate performance. Each method-measurement has some drawbacks because they either are one dimensional (thus a focus on only one or two areas of social responsibility performance, ignoring the others) and therefore may not adequately reveal the overall level of CSR in the aviation industry, or in other cases its applicability is cumbersome across a range of industries [6, 7].

4 Economic models of CSR in the aviation industry

It is evident that a formal dynamic microeconomic model that accounts for several dimensions of CSR, in terms of both different types of CSR and the various drivers and mechanisms, is non-existing. Paul R. Portney, in Hay, Stavins and Vietor [5] indicates that, in spite of the enormous amount of empirical research on CSR, very few, if any, have formulated test-worthy hypotheses from an adequate theoretical model of the firm. Moreover, some studies identified some basic mechanisms of how socially responsible behaviour leads to an economic/financial advantage. A general overview of how such mechanism might be viable was provided by Portney: by engaging in CSR, output price (price differentiation), wages (higher worker productivity or lower wages through worker satisfaction), and the cost of capital (risk reduction due to lower risk of conflict with stakeholders) become to some degree endogenous to the firm. Paul and Siegel [12] suggest that a more salient issue is the relationship between economic performance and CSR behaviour, where the former is comprised of technological and economic interactions between production of output and input demands, capital formation and recognizing the opportunity costs of inputs. They concluded that there should be a balance between the costs and benefits of CSR activities to motivate aviation firms to commit their resources.

There have not been many attempts to formally and consistently model the microeconomic mechanisms behind voluntary over-compliance at the firm level for CSR. Arora and Gangopadhyay [1] proposed a game theoretical model of voluntary over-compliance which assumed that aviation firms signal their “greenness”. Therefore, if stakeholders prefer products and services from a “greener” or socially responsible firm, then the cost of being
environmentally friendly would be justified because it could result in higher revenues.

McWilliams and Siegel [10] suggested a profit-maximizing CSR model that covers the wide range of costs and benefits that must be considered when investing in CSR projects. They further identified some implications of CSR when information is asymmetric between firms and stakeholders as well as some discussions on the relevance of reputation and the strategic use of CSR. Directly related to the concept of reputation is goodwill capital in a microeconomic setting of the socially responsible firm which was introduced by Lundgren [9] and Kriström and Lundgren [8]. While the focus by Lundgren [9] was on uncertainty in the evolution of goodwill and the timing of abatement investments, Kriström and Lundgren [8] developed a model in which voluntary abatement investments (one dimension of CSR) generates a stock of goodwill capital which makes it possible for aviation firms to differentiate their product.

5 Modelling the cost-benefits of CSR

Cost benefit analysis (CBA) assesses the monetary social costs and benefits of capital investment in projects (including CSR) over a given time period. The principle of CBA includes:

a. Appraisal of a project: This is an economic technique for the appraisal of CSR projects which is widely used for other types of projects in the aviation industry, as well as other public-sector projects.

b. Incorporation of externalities into the equation: This includes wider social/environmental impacts as well as ‘private’ economic costs and benefits so that externalities are incorporated into the CSR decision-making process. Consequently, CBA can be used to estimate the social welfare effects of a CSR investment.

c. Time factor: CBA takes into account the economics of time – known as discounting. This is essential when looking at the social and environmental impacts of CSR projects in the years ahead.

Because financial resources in the aviation industry are scarce, CBA makes it possible for firms to rank their CSR initiatives in order to provide the highest expected net gains in social and environmental welfare. The core of any investment appraisal decision is the basic question of whether the CSR project can lead to a net increase in social, community or environmental welfare. The 4 stages of determining CSR are as follows:

a. The first stage is divided into two main parts. First is the calculation of social costs and social benefits which include the calculation of tangible benefits and costs (thus direct costs and benefits) and most importantly the intangible benefits and costs such as CSR (thus indirect costs and benefits of externalities). Second is the sensitivity analysis of events occurring, which relates to the estimate that a possible benefit (or cost) is of a particular value and the outcome of it also has its value. If it is certain that a benefit or cost will occur, then the scale of uncertainty about the actual values of the costs and benefits should be determined.

b. The second stage discounts the future value of benefits, as the costs and benefits accrue over time. However, individuals and society in general normally prefer to enjoy the benefits now rather than later. Therefore, the value of future benefits has to be discounted.

c. The third stage compares the costs and benefits to determine the net social rate of return.

d. The fourth stage compares the net rate of return from different projects. Firms in the aviation sector may have limited funds at their disposal and therefore face a choice about which projects should be given the go-ahead.

The model provided in this paper brings all the relevant stakeholders (such as consumers, the financial sector, government, employees and regulatory bodies) who reward CSR behaviour, as well as the cost of CSR and the benefits in terms of higher profitability to the aviation firm. Indirectly, it is assumed that firms are socially responsible for strategic reasons: that is, it is good business, or at least not bad business. The analysis relies on dynamics - a relevant attribute of CSR since it has a potential effect on reputation or goodwill - which has inherent, inter-temporal variations. In specific terms, it is assumed that goodwill capital that is derived from CSR is a stock that acts upon a firm’s revenues and costs in different ways. An inter-temporal setting is reasonable when analyzing CSR investments and goodwill capital. The CSR initiatives build trust and goodwill capital over time, which can be seen as an intangible asset, a form of “reputation”.

There are some assumptions around the economic benefits and costs of CSR. In terms of the benefits of CSR they are explained as follows:

- Consumers recompense CSR efforts by a price premium, or by patronizing more of the services of the aviation firm at the same price. Thus, all other things being equal, this leads to an increase in revenues and profits for the firm.
- Wage is to some extent endogenous to the firm; thus, ceteris paribus, employees are willing to
accept lower wages to work at a CSR firm, or work more productively at the market wage rate [3].

- There is a reduction in the cost of capital as the financial sector and portfolio managers assign lower risk to firms that are socially responsible [4].

Based on a review of the CSR literature, the benefits listed above emerge as the “usual suspects” when trying to rationalize CSR behaviour at the firm level. The costs of CSR are categorized into three, namely:

- Actual cost of investment in CSR initiatives: irrespective of the nature of CSR projects, there is always a cost of investment accrued for engaging in such projects. It is assumed that the cost is linear to the amount invested in CSR.
- Promoting (advertising) cost of CSR investments to stakeholders: Without the knowledge of the firms’ stakeholders of CSR behaviour, the benefits of its implementation cannot be fully realized. Together with the project investment, these constitute the unit cost, or price, of CSR investments.
- Costs that arise from crowding-out effects of CSR: Productive investments or production are restrained to cater for CSR. The assumption is that, CSR may hamper the “conventional” activities of the aviation firm, and that the increment in CSR cost will be at an increasing rate.

The CBA of CSR can be put into a formal model in a general form. The essence of the model is to put the main variables of cost and revenue into perspective, together with the other extraneous variables that affect the firm’s investments into CSR initiatives. The model begins with a definition of the instantaneous profits of the aviation firm, \( \beta \), at time \( t \) as:

\[
\beta = \beta(g,G,I^*) = R(G,I^*) - C(G,I^*) - T(g)
\]  

In this model, the terms on the right side represent revenues \( R \) and costs \( C \). The first two terms’ functions depend on the goodwill stock, \( G \), and a set of parameters given by \( I^* \), which are exogenous to the aviation firm. Also, \( I^* \) represents inputs like labour and capital that have been optimally chosen and are taken as given. This means that, it is possible to abstract from \( I^* \) in the sequel, and thus focus only on the inter-temporal problem that arises from investment in CSR and the goodwill stock. The last variable is in the profit function, \( T(g) \), that integrates all the costs associated with investments in CSR, \( g \), a control variable which is considered to be one-dimensional. Realistically, the control variable in the model might be described as multidimensional because CSR could take several forms. However, in simple terms, CSR is treated as an investment which is a one-dimensional control variable. Regarding the revenue (benefit) function, it is assumed that:

\[
R_G > 0, R_{GG} < 0
\]  

where \( R(0) = R^* \) = revenue with zero goodwill stock. This is known as the price premium or product differentiation effect. By increasing goodwill, the aviation firm can increase revenue, but at a decreasing rate. With regards to the cost function, it is assumed that:

\[
C = C(G) = C[w(G), q(G)]
\]  

where: \( w(G) = \) wage rate, \( q(G) = \) cost of capital, \( w(G) < 0, w_{GG} > 0, q_G < 0, q_{GG} > 0, w(0) = \) mean market wage rate, \( q(0) = \) mean cost of capital with zero goodwill. So that,

\[
C_G < 0, C_{GG} > 0, \text{ and } C(0) = \text{mean production costs with zero goodwill stock.}
\]

Here, the costs are decreasing at a decreasing rate in \( G \) due to the beneficial effects on the wage rate and cost of capital. Both of these effects are decreasing at a decreasing rate; therefore, it implies that the firm cannot run the price of labour and capital to zero by investing in goodwill. For the CSR cost function, there is the assumption that:

\[
T_g > 0, T_{gg} > 0, T(0) = 0
\]  

\( T(g) \) is the total cost \( (TC) \) of investing in CSR, including promotional costs and crowding-out costs. Crowding out means that CSR by the aviation firm takes resources from other productive activities at an increasing rate (since \( T_{gg} > 0 \)). This indicates that, small CSR investments are relatively “cheaper” than large investments as a result of convexity in \( T(g) \). The assumptions about functional forms govern how revenues and costs are affected by CSR investments, \( g \), and goodwill, \( G \), and, ultimately the behaviour of the aviation firm. These dynamics are introduced into the setting. Thus, with the functional forms shown above, the value function for the management problem is indicated as:

\[
V = \max_g \int_0^\infty e^{-rt} [R(G) - C(G) - T(g)] \, dt
\]  

where \( V \) is the value function at time \( t \), and \( e^{-rt} \) is a discount factor where \( r \) is the discount rate of the aviation firms. Note that \( V \) is also the value of the
avocation firm since it is defined as a perpetual discounted stream of profits. The management problem is to choose \( g \) to build \( G \) so as to maximize the future stream of discounted profits, given the evolution of goodwill overtime. Hence, this presents an issue that requires prudent managerial decision for firms in the aviation sector. The solution is to have year-on-year estimation of current goodwill value for analysis.

6 Decision-making adjustments of CSR in the aviation industry

When firms have an idea of the options available for adjusting the externalities from their operations, there is a need for an evaluation of the pros and cons of each option for proper decision-making. The choice of which alternative to take is affected by several factors such as what the firm knows, what it would like, what it can afford, what it thinks is necessary, what it thinks is possible, and how it rationalizes these often incompatible issues. Decision-making is always less than totally rational. The economic optimization is vital in the CSR decision-making process.

The economic optimization is determined by the quest to maximise "gain". The "gain" may be either economic or social, and it may be beneficial to an individual, a group or society as a whole. The CSR model proposed in the previous section is based on the assumption that there is adequate understanding of the probability of the occurrence of externalities (nature's tax) and a realistic foundation of weighing the costs and benefits of other courses of action in economic, social and environmental terms. As already indicated in the model, the cost-benefit analysis (CBA) provides an alternative for evaluating the impact of CSR.

![Fig. 1: Fundamentals of cost-benefit analysis](Weber (2008))

In Fig. 1, the marginal benefit (\( MB \)) of increasing investment for a given adjustment is represented by the demand curve, or willingness to pay; this decreases with increasing effort or expenditure on the prevention of externalities from the firm’s operations.

Fig. 1 also shows that the marginal cost (\( MC \)) is identical to the supply curve. The optimum point for CSR investment occurs at the point where the firm’s \( MC \) of investing in CSR projects is equal to its \( MB \). The \( MC \) and \( MB \) evaluations are useful, but they are not without problems - especially because the real impact of the externalities in the aviation sector cannot be expressed in simple monetary terms. It is difficult to place value on human life in an ecosystem that suffers from negligence in aviation operations. Also, the monetary values are difficult to place on long-term or wide-spread reductions in environmental quality. Therefore, because of environmental variability, perceptual uncertainty and imperfect knowledge about the potential of emissions or pollution, rational maximization of gain does seem a rather optimistic goal.

From Fig. 1, the equilibrium of the CBA of CSR is where marginal benefits and marginal costs are equal. This point is the optimum position of investing in CSR for a win-win situation for the aviation firm and society. A simplified version of the equilibrium is provided in Fig. 2.

![Fig 2: Equilibrium position of the CSR investments](Authors elaboration based on Weber (2008))

In Fig. 2, the equilibrium is at point \( Q \). The surplus is shown by the area \( OEP \). The best possible solution is at the equilibrium because the surplus is greatest. From Fig 2, it is seen that if \( Q \) were to increase to point 1, the \( MC \) would exceed the \( MB \), meaning it would not be economically efficient. If \( Q \) were to decrease to point \(-1\), some of the surplus would be lost, which would result in inefficiency. The aim of the CBA is to maximize economic efficiency at point \( Q \), because \( MB=MC \). It must be stated that the uncertainty that surrounds these
forecasts can create a fundamental problem when formulators of policies rely entirely on CBA to make a decision.

7 Conclusion

In conclusion, the microeconomic underpinnings of CBA provide an understanding of the mechanisms and incentives behind the behaviour of socially responsible firms in the aviation sector. In their quest to maximize profits, these firms consider both the costs and benefits of CSR investments. Aside the intangible nature of CSR assets, the reason for the reluctance of many aviation firms to invest in CSR is the perceived imbalance between such investments and the revenues or direct profits of the firm. The implication is that there should be a win-win situation (equilibrium or point of convergence) for aviation firms to be encouraged to invest in CSR initiatives and projects. Also, firms will engage in CSR activities if stakeholders - such as the government, the financial sector, consumers, non-governmental organizations among others - reward or pressure firms to engage in such behaviour. Therefore, the link between profitability and different dimensions of CSR is likely to differ across countries, sectors, and even firms. Finally, the economic models on CBA provided in this paper are essential in understanding the economic background of CSR initiatives and for constructing relevant hypotheses in empirical applications.

References: