

Erasmus Platform for Sustainable Value Creation

Working paper

Decision rules for long-term value creation

Willem Schramade
Dirk Schoenmaker
Reinier de Adelhart Toorop



Working paper

Decision rules for long-term value creation

May 2021

Willem Schramade*

Erasmus Platform for Sustainable Value Creation
Sustainable Finance Factory

Dirk Schoenmaker

Erasmus Platform for Sustainable Value Creation
Rotterdam School of Management, Erasmus University

Reinier de Adelhart Toorop

Impact Institute

Abstract

Future-oriented companies manage for long-term value creation (LTVC) rather than merely for shareholder value or stakeholder value. Managing for LTVC involves managing and balancing several types of value (financial, social and environmental) at the same time, often involving trade-offs. Companies need to have decision rules that help them make investment decisions accordingly. This article derives such decision rules by starting from what is needed for LTVC, and by showing to what extent it differs from shareholder value maximisation only. It also outlines transition pathways for companies that are currently value destructive on one of the dimensions. Finally, it introduces a few simple models that allow for the prioritisation of specific types of value, in line with a company's purpose.

Key words: Capital budgeting, net present value, integrated present value, financial capital, social capital, natural capital

* **Acknowledgements:** We would like to thank Arnoud Boot, Erik Breen, Alex Edmans, Charles Evers, Gianfranco Gianfrate, Hans Haanappel, Abe de Jong, Colin Mayer, Daniel Metzger, Kjell Nyborg, Annebeth Roor, Arjen Siegmans, Hans Stegeman and participants at the RSM lunch seminar and the Erasmus Platform for Sustainable Value Creation for very useful comments and suggestions.

1. Introduction

The dangers of climate change have been known for decades, but we hardly take any serious action. In addition, we face growing economic inequality and major social problems (Stiglitz, Sen and Fitoussi, 2009). The overexploitation of the planet continues and is so great that ecological and social disasters are becoming more frequent and more likely. In doing so, we undermine the future of our societies. That makes ecological and social problems also a financial problem.

All this puts the financial-economic system under pressure. The system has brought great prosperity to many, but more and more people are disappointed with the social and ecological results. There is an urgent need for better outcomes, to stay within social and planetary boundaries. Hence, we need a different company objective: long term value creation (LTVC) rather than shareholder value or traditional stakeholder value. LTVC combines the strengths of both shareholder and stakeholder models to make staying within social and planetary boundaries more likely. It implies different steering and requires different decision rules. This article outlines such alternative decision rules, which help companies to balance the various types of value and to deal with trade-offs.

The standard valuation method in finance is the Discounted Cash Flow (DCF) model, which derives the company value from discounted future cash flows (Brealey, Myers and Allen, 2020). The standard DCF model takes only the cash flows derived from financial value into account. But that is not the full story. Environmental and social value should also be considered. Early attempts to do so are the balanced scorecard and the multicapital scorecard, which incorporate financial, social and environmental indicators in a qualitative way into strategy setting and decision-making (Kaplan and Norton, 1997; McElroy and Thomas, 2015). The scorecard approaches led to a search for key performance indicators derived from strategic goals (Parmenter, 2015). But it is not clear how to weigh and aggregate the different indicators. To address that problem, a more quantitative approach, multiple decision criteria analysis, emerged in the operations research literature (Greco, Figueira and Ehrgott, 2016; Hallerbach and Spronk, 2002). This method allows to weigh different criteria or goals in management decision-making.

Recent developments in impact valuation enable companies to measure environmental and social effects and express these in monetised form via cost-based or welfare-based prices (Serafeim, Zochowski and Downing, 2019; De Adelhart Toorop et al., 2019). The monetisation of the different value components allows aggregation. Long-term value is based on the concept of integrated value, which combines financial, social and environmental value in an integrated way (Schoenmaker and Schramade, 2019). In this new valuation model, the decision rule for investments moves from net present value (NPV) of financial flows to integrated present value (IPV) of financial, social and environmental flows.

This article derives a new model for calculating the integrated present value. The perspective taken is that of the company, that aims to behave socially responsible (Mayer, 2018; Schoenmaker and Schramade, 2019; Edmans, 2020). The article contributes to the literature on corporate governance, which has introduced the concept of long-term value creation (Mayer, 2018).¹ It also contributes to recent advances in financial reporting to include sustainability information.² The missing link is how to steer investments on this new information, linked to a company's mission. This article aims to fill this gap.

This article is organised as follows. Section 2 describes what is problematic in the current shareholder value and stakeholder approaches; and the missing ingredients provided by LTVC. Next, section 3 outlines what LTVC would look like and imply in terms of decision-making. This, in turn, allows us in section 4 to classify both corporate investment decisions and corporate value creation profiles in terms of LTVC versus shareholder value. While both overlap in two thirds of cases, it is the remaining third that is crucial to analyse and fix. They help us to derive LTVC principles and their modelling implications in section 5. Section 6 applies the model to various settings and types of companies. Finally, section 7 concludes.

2. Alternative corporate objectives: from shareholder value to LTVC

The current corporate models do not succeed in keeping us within social and planetary boundaries. The shareholder value paradigm does not account for social (S) and environmental (E) externalities or the long-term health of the company (Schoenmaker and Schramade, 2019). Moreover, the synergies between financial (F), environmental (E) and social (S) value tend to be ignored. That is, a company's ability to create value on E and S makes it more likely to be value creative on F in the long run as well: as externalities (both positive and negative) are being internalised, they affect F. That is, the heavy polluter will see its F diminished or even go negative, whereas the companies that provide solutions for solving negative E and S are rewarded with stronger F.

Some argue that companies cannot afford to be less value destructive on E and S, since that will price them out of the market (Kaplan, 2020). However, the product competition argument is less strong in practice. It assumes implicitly that the externality is static, which is not the case (Kurznack, Schoenmaker and Schramade, 2021). Companies with high margins can give up part of that margin by incurring higher costs without changing the pricing of their products. Moreover, companies can adjust their business model and design transition pathways to reduce negative E and S over time (see section 3).

From a value creation perspective, shareholder value effectively maximises F (with sometimes a short-term bias), at the cost of E and S and long-term F (Schoenmaker and Schramade, 2019).

¹ See, for example, the UK corporate governance code 2018 <https://www.frc.org.uk/directors/corporate-governance-and-stewardship/uk-corporate-governance-code>, and the revised Dutch corporate governance code 2016 <https://www.mccg.nl/?page=4738>.

² See, for example, the steps of the IFRS to create a Sustainability Standards Board <https://www.ifrs.org/projects/work-plan/sustainability-reporting/>.

Where companies contribute to negative values for E and S, these outcomes are undesirable from a societal perspective. Managing on stakeholder value is better, but it is not good enough. A focus on stakeholders typically means that future generations and the environment are not safeguarded since they do not raise their voice. Moreover, the stakeholder model scores poor on accountability as it does not give clear decision-making rules (Tirole, 2001). In conclusion, neither model ensures that we stay within social and planetary boundaries.

To get there, we need a model that ensures:

- A long-term perspective;
- Inclusion of interests of all current and future stakeholders;
- Accountability.

A possible model is LTVC, which is based on the concept of integrated value, combining financial value (F), social value (S) and environmental value (E) in an integrated way (Schoemaker and Schramade, 2019).³ Many techniques exist to measure F (in the past), and forecast it (in the future). Still, until recently, this has not been the case for E and S. Environmental and social issues can be incorporated into business decisions together with governance issues under the umbrella of ESG. ESG information can be qualitative or quantitative, but it is rarely in monetised form, meaning that outcomes in the environmental and social dimension (as well as the governance one) could not be treated on equal footing with the financial dimension.

This has changed with the development of the field of impact valuation. Recent developments in impact valuation increasingly enable companies to not only measure or forecast environmental and social effects, but also to express these in monetised form via cost-based or welfare-based prices (Serafeim, Zochowski and Downing, 2019; De Adelhart Toorop et al., 2019; De Bruyn et al., 2018; Galgani et al., 2020).⁴ At the moment, assessments of E and S⁵ are typically less robust than those of F, which is already hard to value in practice (Mukhlynina and Nyborg, 2020). Few companies use social and environmental assessments explicitly to steer on. In this paper, we anticipate the further development of impact valuation to robust indicators that can be used for steering. We ask ourselves what that steering should look like – and in particular what should be the relation between E and S on one side, and F on the other. In other words, how can we define and steer on integrated value.⁶

³ Edmans (2020) provides an alternative model on long-term value creation ('growing the pie') based on principles rather than calculations. His principles of multiplication, comparative advantage, and materiality, should guide a manager's judgement to deliver value in complex situations with multiple stakeholders.

⁴ See also the Natural Capital Protocol (2016): <https://naturalcapitalcoalition.org/natural-capital-protocol/> and the Social and Human Capital Protocol (2019): <https://social-human-capital.org/protocol/>.

⁵ In line with standard valuation methods, S and E are measured in absolute terms (e.g. the amount of carbon emissions multiplied by the relevant carbon price).

⁶ Integrated value is related to the capitals approach of the International Integrated Reporting Council (2013), which uses six capitals: financial and manufactured capital (financial value), social and human capital (social value), natural capital (environmental value) and intellectual capital (all three values).

A 'simple' way is to sum F, E and S. Note that this is now possible, as environmental and social value are expressed in the same language as financial value. But we should proceed with caution here. Netting of values should be avoided in different dimensions (De Adelhart Toorop et al., 2019). After all, businesses that reduce but do not eliminate negative E and/or S can still have positive integrated value if F is sufficiently large. But it can be debated whether they create value for society.

The challenge is thus: how to operationalise Integrated Value? The next sections make LTVC more tangible by asking what it means when companies do indeed manage for LTVC. What kind of outcomes and behaviour do we need to observe? To what extent and in what situations will decisions deviate from shareholder value? And what principles can we derive from those deviations?

3. Characteristics of a LTVC model

What do accountability and a long-term perspective mean? A long-term perspective takes into account all current and future stakeholders. This includes nature and has the following implications. First, it implies an economy operating within planetary boundaries (Steffen et al., 2015). Collectively, economic actors should not contribute to (further) exceedance of the safe operating space for planetary systems (e.g. no net emission of greenhouse gases, no contribution to biodiversity loss). In the language above, this means that the sum of all firms should not create negative impact on E.⁷ For the planet as a whole, not impairing the systems is not enough. In particular for biodiversity, climate and nitrogen, the eco-systems should actively be restored to fit the planetary boundaries again (Steffen et al., 2015). While this cannot simply be demanded from businesses, they should contribute to restoring the systems where possible (e.g., by net carbon and nitrogen sequestration and restoring biodiversity). Ideally, the typical or average firm creates positive value on E.

Second, and likewise, it implies an economy operating above social thresholds, which means no exploitation, living wage paid in each part of each corporate value chain, contribution to local communities, etc. (Raworth, 2017). So, the sum of all firms creates at least a non-negative value on S. Ideally, the typical or average firm creates positive value on S. Third, it implies an economy operating within financial boundaries, which means that business models are economically viable to be able to generate E and S value as well. Hence firms create positive value on F.

Boundaries should not be interpreted in an absolute way. Given the non-linear impact of shocks to complex ecosystems, the precautionary principle states that actors should stay clear of environmental boundaries under conditions of uncertainty (Weitzman, 2009). This implies an increasing price for environmental externalities, which becomes prohibitive when the

⁷ An even stronger version of this statement gives that the sum of all firms should not create negative impact on any dimension within E, such as climate and biodiversity. For ease of exposition, the paper looks at aggregate E and S.

boundary is approached. For social impacts, directly contributing to the fact that people live below the social threshold is seen as a social externality, e.g., when paying employees below the living wage (Galvani et al., 2020, Anker and Anker, 2020). In addition, much of the social boundaries can be guaranteed by governments, paid by taxes (Raworth, 2017). It can be debated whether all taxes paid constitute a positive contribution to S (PwC, 2013) or whether tax avoidance is a negative contribution (True Price, 2020).

The three implications mean that E, S and F are all non-negative, or even positive on aggregate, i.e. the economy is in quadrant 2 of the value creation matrix (see Table 1). To achieve that, E, S and F will need to become positive for most companies. Companies that are now in quadrant 1 will have to move to quadrant 2 to remain in business or face collapse (quadrant 3). The end model is quadrant 2 and we need transition pathways for quadrant 1 and 4 (Kurzack, Schoenmaker and Schramade, 2021). That is a business opportunity for the frontrunners, especially when governments will speed up their rules and taxes to internalise social and environmental externalities - which often happens. For example, many companies such as Philips and Novozymes will benefit from a serious carbon price, as these companies have adopted a strategy aimed at reducing carbon emissions ahead of their competitors (Schoenmaker and Schramade, 2019).

Table 1: Value creation matrix

	E+S value destroying	E+S value creating
F value creating	Quadrant 1 Overexploitation	Quadrant 2 Win-win
F value destroying	Quadrant 3 Collapse	Quadrant 4 Charity

Source: Schramade (2020).

Remediation markets can also play a role in the transition pathway (True Price, 2020). Companies that have negative E and/or S, but sufficiently large F can fund organisations that have positive E or S, but did not have a positive business case before. If the latter can scale up, their growth in E or S can offset the negative values of the former, while both have positive F.

Accountability also has several implications for companies. First, it means that they have visibility on their value creation on E, S, and F; and provide a reasonable level of transparency on it. Second, they can explain/show how they trade-off the choice between E, S and F wherever they occur. Third, companies (and their managers) that are value creative on E, S and F are rewarded and incentivised accordingly. Fourth, companies that are value destructive on E, S or F will need to show a path towards value creation across all value dimensions.

Companies don't need to be closed immediately if the value destruction is temporary, but they will have to show a clear and credible commitment to a transition pathway that brings them to zero or net positive value creation on their problematic value dimension.

In a model of human well-being which depends on material, social and environmental goals, Lima de Miranda and Snower (2020, page 9) put the assessment of and potential trade-offs across the goals as follows: "This balance [of goals] may best be conceived in allostatic terms – that is, there may be a range of values over which these goals are in balance and a range of values over which they can compensate for one another. Within these ranges of balance, well-being depends on the degree to which each goal is achieved; outside these ranges, well-being is largely determined by the goal that is most underachieved". They label this approach as a "balance-oriented well-being function". The concept of allostasis, taken from the health sector (see box 1), can be used to apply a specific treatment or method to address a shortfall in any of the value dimensions instead of a general approach.

Box 1: Allostasis

The concept of allostasis comes from designing therapies in the health sector (Sterling, 2004). The question is how to restore stability in response to a serious challenge. Examples of health challenges are type 2 diabetes (high blood glucose level) or hypertension (high blood pressure). Homeostasis and allostasis are endogenous systems responsible for maintaining the internal stability (from the Greek word of stasis) of an organism.

The concept of homeostasis is based on a similar (from the Greek word homoios) treatment of a particular challenge. For example, control of blood pressure by drugs (such as beta-blockers). The use of drugs is then a general therapy to restore high levels of blood pressure back to normal levels. By contrast, the concept of allostasis is based on other (from the Greek word allos) treatments. Allostasis emphasises higher level interventions, whereby the therapy is attuned to treatment of the underlying cause of the challenge. High blood pressure can have several causes, such as obesity, smoking, or alcohol (Sterling, 2004). The therapy is no longer general drugs-based, but aims to treat the underlying cause, for example, weight loss, exercise, diet reduced in sodium and fat and increased in calcium and fibre, cease smoking or moderate alcohol consumption.

The allostasis principles can be applied to the evaluation of investment projects. When the situation is stable (all three value dimensions are positive), there is no need for extra attention to particular value dimensions. A general approach to optimise value creation suffices. However, if there is a shortfall in one (or more) value dimension(s), this particular value dimension needs to be restored first. The 'therapy' is then focused on designing a transition pathway to restore the underperforming value dimension to 'normal' levels.

Applying a balanced approach, we should observe the following behaviour:

- Investment decisions are net value creative on integrated value. Net negative integrated value investments (i.e., those that have E+S with a larger negative than F is positive) are unacceptable and not done. Insofar as they are already in progress, they are trimmed down over a transition period. Most fossil fuel investments are likely to be examples of this category.

- Investments that have negative E and S, but that are still net positive on integrated value due to positive F, are not acceptable either. However, they can be made acceptable through remediation of the negative E and S at the expense of (part of the) F. Insofar remediation is not possible and the investments are already in progress, they are trimmed down over a transition period (working with minimum reference points and transition pathways back to the planetary/social boundary).
- Investments that have negative E and positive S or the other way around are critically reviewed. They can only be acceptable if the positive contribution is larger than the negative one – and even then they are problematic, as their contribution to some stakeholders comes at the expense of others. Remediation for the negative impacts should be considered.⁸
- In general, companies with substantial value destruction on E, S or F gear their investments and efforts to fixing their underperforming type of value, rather than maximising their better performing value dimension (allostatic principle).
- Investments can be positive on all three value dimensions. In such cases, the prioritisation of further improvements will depend on the company's purpose and opportunities. It then also makes sense to add up the three types of value.

Summing up, if all three value dimensions are positive (i.e. in balance) then weighted summing is allowed. If one or more is negative, then the most negative dominates. A credible transition pathway back to positive is then the main focus. The next section applies this balanced approach to corporate investment decisions and corporate value creation profiles in order to derive valuation and investment principles.

4. Classifying corporate investment decisions & value creation profiles in a LTVC model

In this section, we classify corporate investment decisions and value creation profiles on current decision-making rules. These include a positive net present value (NPV) on the F dimension for investment projects representing long-term financial value, and a positive annual value creation on the E and S dimensions. This classification is compared with the desirability from a long-term sustainable value perspective, based on integrated present value (IPV).

4.1 Classifying corporate investment decisions

Let's assume a simplistic world in which investment decisions can vary across three dimensions: performance on F, E, and S; and in which each can take only three values: positive, zero and negative. By assigning these values, we get 27 ($=3^3$) cases. Table 2 summarises the 5 types of investment implications yielded by those cases. Table 2 also indicates whether there is alignment between the NPV F and IPV $F + E + S$ decision criteria whether the investment should be done.

⁸ In fact, the same argument can be made for investments that are positive for some aspects of E (or S) while being negative on others. E.g., a company that sequesters greenhouse gases to limit climate change, but harms biodiversity.

The top and bottom rows of Table 2 show the cases where there is alignment between integrated present value and net present value of F. The other cases are the interesting ones:

- **Overinvestment** in the third type where investment does happen (because NPV $F > 0$) while it should not (serious harm to E and/or S).
- **Underinvestment** in the fourth type where investment does not happen (because NPV $F < 0$) while it should ($IPV > 0$, and no serious harm);

Such investment decisions are not made in isolation, but in a particular corporate context. Hence, it makes sense to classify corporate value creation profiles as well.

Table 2: Balancing F, E, and S in investment decisions

Project type	Value of F, E and S	NPV F says	IPV F+E+S says	Alignment between the two	Explanation
1	$F > 0, E \geq 0$ and $S \geq 0$	yes	yes	yes	All three ≥ 0 , so IPV positive. So do unless there are better projects. Done since $F > 0$ unless competing projects offer higher F.
2	$F > 0, E < 0$ or $S < 0$ such that still $F+E+S > 0$	yes	yes	yes	F and IPV positive, so do unless there are better projects. Remediation of the harm in the negative component should be seriously considered.
3	$F > 0, E < 0$ and/or $S < 0$ such that $F+E+S \leq 0$	yes	no	no	F positive but harm elsewhere (negative E and/or S) is serious. It is currently done, but is not desirable.
4	$F \leq 0, E$ and S such that $F+E+S > 0$	no	yes	no	Negative F, but positive E, S and IPV, so should be done from societal perspective. But the company rationally doesn't do it.
5	$F \leq 0, E$ and S such that also $F+E+S \leq 0$	no	no	yes	IPV negative, so don't do it. "Fortunately" also $F \leq 0$ so companies are not tempted to do so

Source: Authors' analysis. Note: F is Financial, E is Environmental, and S is Social. NPV is Net Present Value and IPV is Integrated Present Value.

4.2 Classifying corporate value creation profiles

In the same way that we classify corporate investment decisions, we can also classify corporate value creation profiles. Let's assume a simplistic world in which corporate value creation profiles can vary across three dimensions: annual value creation on F, E, and S; and in which each can take only three values – the same three values as used for the corporate investment profiles: positive, zero and negative. Again, we get 27 cases. A positive integrated value (IV) provides a company its license to operate (Kurznack, Schoenmaker and Schramade, 2021). Table 3 summarises the 5 types of value creation profiles yielded by those cases.

Table 3: Balancing F, E, and S in corporate value creation profiles

Company type	Value of F, E and S	Company viable on F	Company license to operate	Alignment between the two	Explanation	Policy implication	Investor implication
1	$F > 0, E \geq 0$ and $S \geq 0$	yes	yes	yes	All three ≥ 0 , so IV positive. I.e. societally desirable		
2	$F > 0, E < 0$ or $S < 0$ such that still $F + E + S > 0$	yes	yes	yes	F positive, can have a mix of positive and negative in the other dimensions. Currently done. IV positive, so societally desirable – although eye for the negative component is important	Negative components should be mitigated, i.e. incentives put in place for the company to pay for avoiding the negative impact	Internalisation a real possibility, i.e. F affected by fixing S or E. Still an investment opportunity, but might be smaller
3	$F > 0, E < 0$ and/or $S < 0$ such that $F + E + S \leq 0$	yes	no	no	F positive but harm elsewhere is serious E and/or S & IV negative. It is currently done, but should not	Should be mitigated as described above	Expect internalisation and demand a credible path towards addressing the negative impact from company
4	$F \leq 0, E$ and S such that $F + E + S > 0$	no	yes	no	Negative F, but positive IV through E and S. Societally desirable, but company isn't financially viable	Company should be directly paid for doing this or rules/incentives to be changed to make this viable on F	A whole new set of investment opportunities to be opened up
5	$F \leq 0, E$ and S such that also $F + E + S \leq 0$	no	no	yes	All three ≤ 0 , so IV negative, so neither financially viable nor societally desirable		

Source: Authors' analysis. Note: F is Financial, E is Environmental, and S is Social. NPV is Net Present Value and IV is Integrated Value. Company license to operate is based on positive Integrated Value.

Type 1 and 4 companies are socially desirable, but type 4 companies are not financially viable unless they are supported by the government (e.g. via subsidies) because of their social desirability. Type 5 companies are neither socially desirable, nor financially viable. But in practice, such zombie companies might be kept alive by government subsidies. The main challenges are represented by type 2 and 3 companies. Some of these are highly exploitative (type 3 with negative integrated value), yet legal, such as tobacco companies. Companies of type 2 are net value creative, but are value destructive on E or S. Such companies are less harmful than the former, but they are more numerous: a large part of the economy effectively has this profile.

The worst are type 3 companies doing type 3 projects. LTVC decision rules should aim for type 3 companies to engage in type 1, 2 or 4 projects in order to change their overall value creation profile towards type 1. The principle of allostasis calls for these companies to do projects that

repair the type of value that their business destroys most of. The same holds – less urgently – for type 2 companies. Ideally, type 1 companies do type 1 projects. But even those companies need to decide what to prioritise. That then depends on their purpose (Mayer, 2018).

4.3 Limitations of the use of IPV $F+E+S$ as a decision criterion

In sections 4.1 and 4.2, we have translated being societally viable (for an investment) and having a licence to operate (for a company) to the IPV of $F + E + S$ being positive. This is clearly an assumption – and indeed one that can be challenged. When discussing investments and companies of type 2, we found that these pose a challenge. While they are indeed value creating as a whole, they do destroy value in E and/or S. We have suggested looking into the possibility of remediation. But if that is not possible, are these investments and companies indeed viable? Is allowing netting over different dimensions, as we have implicitly allowed, really advisable?

Edmans (2020) describes value transfers between F, E, and S. He describes these as harmful in the long run even for the value dimension that is advantaged in the short term. Edmans calls these transfers the splitting the pie mentality, whereby stakeholders argue about their share of the pie. However, within projects, such value transfers can also occur without stakeholders being involved or even being aware of them. Moreover, balanced value fostering is likely to result in long-term value creation across all values, which creates synergies and may grow the pie.

5. Corporate decision-making principles & rules in a LTVC model

In this section, we develop principles for value balancing. These principles allow us to design decision rules, which we apply in a LTVC model.

5.1 Corporate decision-making principles

Based on the discussion of the LTVC model in sections 2 and 3 and the numerical examples in section 4, we propose the following framework principles for value balancing:

1. **Health: value creation is stimulated and needs to be positive on all three value dimensions.** The long-term goal is to be positive on all three value dimensions and should apply to all decisions, but is not always possible on current operations / legacy assets.
2. **Allostasis: where value is destroyed on one of the value dimensions, a credible path to ending the value destruction needs to be established.** This should apply to all three value dimensions.
3. **Non-substitutability: netting should supposedly be avoided.** This means that negative effects are in principle not compensated by positive effects, even not within the same category; this is the principle of non-substitutability.⁹

⁹ For example, if a project reduces GHG emissions, but hurts biodiversity, then both these effects should be visible and considered. It does not necessarily mean that the project cannot proceed, because otherwise nearly nothing can happen. We'll have to find this out in practice. Initially, it will mainly be about avoiding big negatives, either in total (working with reference points or budgets for planetary and social boundaries) or on a single stakeholder (e.g., death).

4. **Purpose: companies should have scope (conditional on the above) to set their own purpose and incorporate that into decision-making.** The purpose reflects what companies are good at.¹⁰ Accordingly, the company can prioritise a specific type of value, without neglecting the others.

Value balancing is already practised by business. In their strategy-setting, companies develop long-term plans to prepare and adjust their businesses to future disruptions and to a world where their performance on climate change, consumer trust and employee satisfaction is becoming equally important as their financial performance. Leading companies are able to create both economic (F) and societal (E+S) value by continuously adjusting their business and operating models to capture opportunities and mitigate risks created by societal trends (Kurzack, Schoenmaker and Schramade, 2021).

Financial and societal value can reinforce each other. Examples are sustainable companies that pay lower wages and/or attract higher talent (Edmans, 2012; Krueger, Metzger and Wu, 2020), realise higher margins through customer awareness (Servaes and Tamayo, 2013) or have higher trust through social capital during times of crisis (Lins, Servaes and Tamayo, 2017). There are also negative feedback loops possible. Exploitation of market power (Philippon, 2019), for example, increases profits (F) but reduces consumer surplus (S). Addressing carbon emissions (E) may reduce profits in the short term (F), but improve a company's competitive position in the long run (F) when higher carbon taxes are implemented (see section 3).

The modelling implications of the framework principles for value balancing are as follows:

1. **Value creation is stimulated and needs to be positive on all three value dimensions.** In annual/normalised terms: the long-term goal is optimising V with $F \geq 0, S \geq 0, E \geq 0$.
2. **Where value is destroyed on one of the dimensions, a credible path to ending the value destruction needs to be established.** This can be captured in transition curves.
3. **Netting should supposedly be avoided.** This means a rule that negative values should 'hurt' more than positive values of the same size. This is possible with parameter $\delta > 1$ for negative values (see below).
4. **Companies should have scope (conditional on the above) to set their own purpose and incorporate that into decision making.** The company's committed shareholders and stakeholders set the priorities for S and E with parameters β and γ .

5.2 Applying the decision rules in a LTVC model

Using the framework principles, we develop different models for LTVC, that is with different goal functions, due to:

1. different formulas for value creation V (different weighting of positives and negatives based on principles #1 to #3)
 - a. Model A – simple summing: $V = F + \beta \cdot S + \gamma \cdot E$
 - b. Model B – no netting: $V = \min (F, \beta \cdot S, \gamma \cdot E)$

¹⁰ This can be interpreted as a company's comparative advantage (Edmans, 2020).

- c. Model C – penalising negatives:

$$V = 1 * \{F^+ + \beta \cdot S^+ + \gamma \cdot E^+\} + \delta * \{F^- + \beta \cdot S^- + \gamma \cdot E^-\}$$
 with $\delta > 1$
 (whereby the superscript +/- stands for a positive/negative value respectively)
2. different parameters for beta and gamma (different weighting of the value dimensions based on principle #4) to allow for both legal/social limits set to companies; and to allow companies to steer on purpose (within limits set by legal regime & society):
- Regime 1: financial regime blind to sustainability: $\beta = \gamma = 0$
 - Regime 2: moderate valuation of sustainability: $\beta = \gamma = 0.5$
 - Regime 3: equal weighting: $\beta = \gamma = 1$
 - Regime 4: purposeful: $\beta = \gamma = 2$

The modelling of LTVC is based on the sustainable finance (SF) typology of Schoenmaker and Schramade (2019). In finance-as-usual only F is included (regime 1). This regime represents the ‘old economy’ $V = F$. In SF 1.0, the focus is on F with limited weighting of S + E. This regime 2 is halfway in between, and may represent a reality for some moderately sustainable companies now. They are willing to prioritise S and E somewhat, but it shouldn’t come at the expense of F too much. Next, SF 2.0 weights the three value dimensions equally and reproduces the simple integrated value model $V = F + S + E$. This is regime 3. Finally, SF 3.0 places higher weight on S and E than on F. This regime 4 represents the views of companies that are not in business for money. These are purposeful companies that actively want to shake up the industry and hope that others may follow. Dutch chocolate brand Tony’s Chocolonely is an example of a company that holds such a view.

Comparative analysis of the models

In this sub-section, we conduct a comparative analysis of the three models. The comparison is based on the value creation profiles from section 4. For illustration purposes, we use concrete values for F, E, and S, which each can take only three values, -5, 0, and 5. Table 4 shows model A with simple summing, whereby substitution (netting) is allowed. The value V of the company is calculated for the four regimes.

Interestingly, even the type 4 company (societally valuable, but financially unviable) becomes valuable under equal weights and purposeful parameters. The problem with model A is that netting is effectively allowed in all regimes (violation of principle #3). Netting can even be done with purposeful parameters (regime 4). As an example, type 2 companies have positive V in this regime, even though they are problematic in the sense that their value creation in F and S comes at the expense of E (and vice versa). They are not “punished” enough in this model for negative contributions (violation of principle #2).

Table 4. Model A – simple summing

	Value	Company type 1	Company type 2	Company type 3	Company type 4	Company type 5
Current value creation profiles	F	5	5	5	-5	0
	S	5	5	-5	5	-5
	E	5	-5	-5	5	0
Regime 1: financial value only	V	5	5	5	-5	0
Regime 2: moderate sustainable	V	10	5	0	0	-2.5
Regime 3: equal weights	V	15	5	-5	5	-5
Regime 4: purposeful	V	25	5	-15	15	-10

Note: This table shows each company type with one value creation profile (taken from Table 2) for ease of exposition. The other value creation profiles lead to similar decisions on valuation. Company type 2, for example, has +5 on S and -5 on E (shown), but also -5 on S and +5 on E.

Model B in Table 5 take this up by not allowing netting. Instead of a calculating V as a linear combination of F, S and E, type B models focus on the type of value that is most negative (principle #2). This model gets rid of the netting problems (principle #3). Also, the financial regime no longer means $V = F$, but becomes $V = \min(F, 0, 0)$. However, type 2, 3 and 5 companies are effectively seen as the same (negative integrated value), which does not seem fair (too restrictive). Note that type 2 companies are negative on S *or* E, while type 3 companies are negative on both. The model does not see this distinction. A drawback of model B is that it can reduce a company’s risk appetite for new projects, as a company may want to avoid potential negative values (at all cost). The one-sided pressure on improving the minimum value dimension limits value creation (violation of principle #1).

Table 5. Model B – no netting

	Value	Company type 1	Company type 2	Company type 3	Company type 4	Company type 5
Current value creation profiles	F	5	5	5	-5	0
	S	5	5	-5	5	-5
	E	5	-5	-5	5	0
Regime 1: financial value only	V	0	0	0	-5	0
Regime 2: moderate sustainable	V	2.5	-2.5	-2.5	-5	-2.5
Regime 3: equal weights	V	5	-5	-5	-5	-5
Regime 4: purposeful	V	5	-10	-10	-5	-10

Note: This table shows each company type with one value creation profile (taken from Table 2) for ease of exposition. The other value creation profiles lead to similar decisions on valuation. Company type 2, for example, has +5 on S and -5 on E (shown), but also -5 on S and +5 on E.

Next, we explore a model where losses/negatives (denoted by the superscript -) have a higher weight versus profits/positives. In general, negative values can be weighted by a factor $\delta > 1$. In Table 6, model C takes a value of $\delta = 2$. This reflects behavioural findings about losses, where losing a certain sum represents equal but opposite well-being as a gain of approximately twice that sum (e.g., Kahneman and Tversky, 1979). However, a loss averse

utility function may lead to risk-seeking behaviour in a loss situation. To address this risk bias, the non-executive board should monitor management (closely) on decision-making and execution of projects in these situations with a (potential) negative value.

Model C seem ‘fair’ – in particular in regime 3 with equal inherent weights of F, S and E. The model indeed distinguishes between type 2, 3 and 5 companies. In addition, the netting problem is significantly mitigated (principle #3). Companies are severely punished for negative values in S or E, but they are not dismissed completely (principle #2). Clearly, remediation then pays off. If a type 2 company can reduce a negative E or S value at the expense of some F, that will *increase* its V. Moreover, the type 4 company (societally valuable, but financially unviable) becomes valuable under equal weights and purposeful parameters. These are social companies that may receive financial support from the government or private sources (charities or philanthropy) for their mission.

Table 6. Model C – punishing negatives ($\delta = 2$)

	Value	Company type 1	Company type 2	Company type 3	Company type 4	Company type 5
Current value creation profiles	F	5	5	5	-5	0
	S	5	5	-5	5	-5
	E	5	-5	-5	5	0
	F ⁺	5	5	5	0	0
	S ⁺	5	5	0	5	0
	E ⁺	5	0	0	5	0
	2*F ⁻	0	0	0	-10	0
	2*S ⁻	0	0	-10	0	-10
	2*E ⁻	0	-10	-10	0	0
	Regime 1: financial value only	V	5	5	5	-10
Regime 2: moderate sustainable	V	10	2.5	-5	-5	-5
Regime 3: equal weights	V	15	0	-15	0	-10
Regime 4: purposeful	V	25	-5	-35	10	-20

Note: This table shows each company type with one value creation profile (taken from Table 2) for ease of exposition. The other value creation profiles lead to similar decisions on valuation. Company type 2, for example, has +5 on S and -5 on E (shown), but also -5 on S and +5 on E.

5.3 Assessments of LTVC models

In Tables 4 to 6, the negative (red) cells mean that the company does not meet its target, that it may be punished, and that it will have to adapt. An example of punishment is long-term investors walking away, if they don’t see improvement potential towards quadrant 2 in Table 1. Another example is that the government effectively forbids or taxes the negative outcomes. For adaptation, companies need credible transition paths (backed up by capex decisions) towards quadrant 2.

Our model-based decision rules can be applied in a dynamic way. Companies (and their financiers) can estimate the value implication of interventions. A clear example is to calculate the integrated present value (IPV) of introducing a low-carbon technology. Another example is to include anticipated costs of reschooling the labour force when designing transition pathways. The framework can also be used to estimate the value creation from engagements of banks and investors with their client companies. Next, the decision rules can be applied to scale up impact. Just like the NPV rule, the IPV rule selects the projects with the highest integrated present value (subject to minimising negative values).

Each model is shown for four different regimes. Regime 1 is the current financial regime, which we need to move away from to stay within social and planetary boundaries. Ideally, we would have most companies operating on regime 3 (equal weights for the three types of value), in an institutional context that has governments and market structures that ensure that the vast majority of all damage in S and E is properly priced. However, since we are not quite there yet, and since most companies are of type 2 or 3 (producing negative social and/or environmental value), we may need higher weights on S and E than on F for new investment projects for quite some years to move back into social and planetary boundaries.

Finally, the question arises which model is capable of achieving long-term value creation. To answer that question, we test to what extent the models satisfy the three principles from section 5.2. Model A adds up the three types of value, with different weights. This is simple but has the drawback that it allows netting (violation of principle #3) and hence the continuation of businesses that are highly value destructive in one sense but happen to be value creative in another way (violation of principle #2). Model A is based on the concept of weak sustainability. Weak sustainability maintains total value, which is the sum of economic, social and environmental capital (Van den Bergh, 2010). This view allows substitution of capitals and is rooted in neoclassical economics (Neumayer, 2013).

Model B solves the netting problem by placing full weight on the weakest link. This, however, may be too restrictive, as it hinders companies to create positive value (violation of principle #1). Model B is in the domain of strong sustainability, which requires that each capital type is maintained separately, that is economic, social and environmental capital (Van den Bergh, 2010). This view applies the precautionary principle very stringently and is motivated by a strict interpretation of the social and planetary boundaries (Neumayer, 2013).

Model C makes a distinction between companies in terms of value creation. Both positive and negative values are taken into account with a higher weight for negative values. This puts pressure on business to address social and environmental externalities. Applying our principles, it appears that model C achieves LTVC as it strives for positive value creation on all dimensions as a long-term goal (principle #1), while providing incentives for phasing out any negative values (principle #2) and substitution (principle #3).

6. Company examples

The ultimate question is whether the decision rules lead to different decisions on corporate investments and in what way. To analyse potential differences, we apply model C to two hypothetical companies: an oil company and a medical technology company. We also show simple adding up of the three value dimensions as benchmark.

Table 7 shows the valuation creation profile of the companies. The value profile of the oil company is typical for the sector: profitable ($F = 3$), but with major environmental externalities due to carbon emissions ($E = -15$) and some social externalities in the supply chain ($S = -2$). The company has no explicit purpose and thus applies equal weights across the value dimensions ($\beta = \gamma = 1$). Model C delivers a large negative annual value creation profile ($V = -31$), as the negative impact of the polluting oil company counts double. Simple adding up delivers a smaller negative value profile ($V = -14$).

Next, the medtech company is strong on its mission of health care ($S = 15$) and profitable ($F = 8$), with some minor environmental externalities ($E = -2$). The medtech's purpose is reflected in the higher weight for S ($\beta = 2$) than for E ($\gamma = 1.5$) and F (1). Model C shows large positive value creation profile ($V = 32$), due to the higher parameter for its social mission. Simple adding up gives a smaller positive value profile ($V = 21$).

Table 7. Value creation profile of an oil and medtech company

Value dimensions & parameters	Company 1: Oil	Company 1: Medtech
S	-2	15
E	-15	-2
F	3	8
β	1	2
γ	1	1.5
δ	2	2
$\beta \cdot S^+$	0	30
$\gamma \cdot E^+$	0	0
F^+	3	8
$\delta \cdot \beta \cdot S^-$	-4	0
$\delta \cdot \gamma \cdot E^-$	-30	-6
$\delta \cdot F^-$	0	0
Annual value creation (model C)	-31	32
Annual value creation by simple adding	-14	21

Note: This table shows the value creation profile of two companies based on three value dimensions (S, E, F). The oil company has equal weights for the value dimensions ($\beta = \gamma = 1$), while the medtech company has higher weights for S ($\beta = 2$) and E ($\gamma = 1.5$) than for F (1). In model C (rows 7 to 12), negative values count double ($\delta = 2$) in the value creation. The bottom row shows annual value creation by simple adding up of the three values (rows 1 to 3).

Table 8 summarises the details of the investment projects available for the oil company. Project 1 and 2 have positive impact on the social side (2) and the environmental side (2) respectively, but make losses (-1). Project 3 has profit (1) with no externalities. We first analyse the choice of projects on a project base. The NPV rule would select project 3 with the highest financial value, which is positive (1). Punishing negative values in model C leads also to project 3, which has no negatives. The simple adding sees no difference among the projects, they all create a value of 1.

The second step is to analyse the projects with regard to the company's value profile, as discussed in section 4.2. The last three columns in table 8 illustrate that model C would select project 1 and/or 2, as these projects (partly) repair the value destruction on the social and environmental side. In terms of section 4.2, the oil company is a type 3 value destructive company, which can improve its value profile by type 4 loss-making projects that generate positive impact.¹¹ Finally, simple adding up does again not distinguish between the projects.

¹¹ An interesting example is the failed take-over of Eneco, an energy utility with a green strategy, by Shell in 2019. This take-over would have improved Shell's environmental profile. But by applying the standard hurdle rate for fossil investments, Shell obtained a low valuation in a business-as-usual scenario and underbid for Eneco. See <https://fd.nl/ondernemen/1328800/waarom-greep-shell-mis-bij-de-verkoop-van-eneco-jfe1camKTfwl>.

Table 8. Change in value creation by an oil company

Value dimensions / parameters	Oil company profile	Project 1	Project 2	Project 3	Company after project 1	Company after project 2	Company after project 3
S	-2	2	0	0	0	-2	-2
E	-15	0	2	0	-15	-13	-15
F	3	-1	-1	1	2	2	4
β	1	1	1	1	1	1	1
γ	1	1	1	1	1	1	1
δ	2	2	2	2	2	2	2
$\beta \cdot S^+$	0	2	0	0	0	0	0
$\gamma \cdot E^+$	0	0	2	0	0	0	0
F^+	3	0	0	1	2	2	4
$\delta \cdot \beta \cdot S^-$	-4	0	0	0	0	-4	-4
$\delta \cdot \gamma \cdot E^-$	-30	0	0	0	-30	-26	-30
$\delta \cdot F^-$	0	-2	-2	0	0	0	0
Annual value creation (model C)	-31	0	0	1	-28	-28	-30
Improvement					3	3	1
Annual value creation by simple adding	-14	1	1	1	-13	-13	-13
Improvement					1	1	1

Note: This table shows the value profile of an oil company which has the choice of three projects. The last three columns show the value profile of the oil company after the project (1, 2 or 3). The oil company has equal weights for the value dimensions ($\beta = \gamma = 1$), while negative values count double ($\delta = 2$). The annual value creation in model C is obtained by adding the adjusted values in rows 7 to 12. The improvement is relative to the original company profile in the first column. The bottom rows show annual value creation by simple adding up of the three values in rows 1 to 3.

Moving to medtech, Table 9 provides the details of the investment projects available for the medtech company. The set-up of the projects is identical to the oil company. Again, project 1 and 2 have positive impact on the social side (2) and the environmental side (2) respectively, but make losses (-1). Project 3 has profit (1) with no externalities. Model C leads to the selection of project 1, due to the medtech's healthcare mission with a higher weight for S ($\beta = 2$). In this way, the company makes use of the comparative advantage (Edmans, 2020) of its purpose (Mayer, 2018).

Analysing the projects from the company's value profile produces a different outcome. Table 9 shows that project 2 is selected, as this project repairs the value destruction on the environmental side. The next project is project 1 with the added value coming from the company's mission. In terms of section 4.2, the medtech company is a type 2 company, which can improve its value profile by type 4 loss-making projects that generate positive impact.

These examples show that similar projects can have a different value for different companies and situations. The value depends on a company's purpose (β, γ) and its starting position with a potential negative value dimension which is weighted heavier (δ).

Table 9. Value creation by a medtech company

Value dimensions / parameters	Medtech company profile	Project 1	Project 2	Project 3	Company after project 1	Company after project 2	Company after project 3
S	15	2	0	0	17	15	15
E	-2	0	2	0	-2	0	-2
F	8	-1	-1	1	7	7	9
β	2	2	2	2	2	2	2
γ	1.5	1.5	1.5	1.5	1.5	1.5	1.5
δ	2	2	2	2	2	2	2
$\beta \cdot S^+$	30	4	0	0	34	30	30
$\gamma \cdot E^+$	0	0	3	0	0	0	0
F^+	8	0	0	1	7	7	9
$\delta \cdot \beta \cdot S^-$	0	0	0	0	0	0	0
$\delta \cdot \gamma \cdot E^-$	-6	0	0	0	-6	0	-6
$\delta \cdot F^-$	0	-2	-2	0	0	0	0
Annual value creation (model C)	32	2	1	1	35	37	33
Improvement					3	5	1
Annual value creation by simple adding	21	1	1	1	22	22	22
Improvement					1	1	1

Note: This table shows the value profile of a medtech company which has the choice of three projects. The last three columns show the value profile of the medtech company after the project (1, 2 or 3). The medtech company has higher weights for S ($\beta = 2$) and E ($\gamma = 1.5$) than for F (1), while negative values count double ($\delta = 2$). The annual value creation in model C is obtained by adding the adjusted values in rows 7 to 12. The improvement is relative to the original company profile in the first column. The bottom rows show annual value creation by simple adding up of the three values in rows 1 to 3.

7. Conclusions

Managing for long-term value creation (LTVC) involves managing and balancing several types of value (financial, social and environmental) at the same time, often involving trade-offs. Companies need to have decision rules that help them to make investment decisions accordingly. This article derives such decision rules by starting from what is needed for LTVC, and by showing to what extent it differs from shareholder value maximisation only. It also outlines pathways for companies that are currently value destructive on one of the dimensions. In addition, it introduces a few simple models that allow for the prioritisation of specific types of value, in line with a company's purpose (Mayer, 2018).

While advances in impact valuation allow companies to measure social and environmental value alongside financial value, these measurements are still approximations under conditions of uncertainty. The balancing of positive and negative values is a key element of the decision rules for LTVC. Just summing of positives and negatives allows for the netting of financial, social and environmental values. Imbalances in the social and/or environmental dimension can then continue to build up, as is currently happening. The other extreme, no netting, is very restrictive. Any negative value should be avoided, which may lead to a standstill of corporate investments and thereby of value creation. Our framework indicates that decision rules that weigh negative values higher than positive values are capable of achieving LTVC. Under these decision rules, companies have an incentive to phase out negative (social and environmental) externalities and thus create positive value on all three dimensions in the long term.

A second element of our decision rules is the weighting across the value dimensions. While shareholder driven companies only value the financial dimension, companies that pursue long-term value creation also give a positive weight to the social and environmental dimensions. Our model allows companies to choose their degree of sustainability: from moderate (weight of half) and equal weights (weight of one) to purposeful (higher weights for the social and environmental dimensions). While the majority of companies may apply moderate or equal weights, purposeful companies are initiators in the return to operating within social and planetary boundaries by shaking up industries and supply chains (Kurznack, Schoenmaker and Schramade, 2021). Companies, that are subsequently capable to scale up their comparative advantage, are the ultimate frontrunners, that accelerate the transition to a sustainable economy (Edmans, 2020).

This article has developed new decision rules based on integrated present value that allow companies to behave responsibly by balancing profit and impact. Following these rules companies can create long-term value and retain (or regain) their social licence to operate.

References

- De Adelhart Toorop, R., J. Kuiper, V. Hartanto and A. de Groot Ruiz (2019), 'Framework for Impact Statements, Beta Version', Impact Institute, Amsterdam.
- Anker, R. and M. Anker (2017), *Living Wages around the World, Manual for Measurement*, Edward Elgar Publishing, Cheltenham.
- Brealey, R., S. Myers and F. Allen (2020), *Principles of Corporate Finance*, 13th edition, McGraw-Hill, New York.
- De Bruyn, S., S. Ahdour, M. Bijleveld, L. de Graaff, E. Schep, A. Schroten and R. Vergeer (2018), 'Environmental Prices Handbook 2017', CE Delft, Delft.
- Edmans, A. (2012), 'The link between job satisfaction and firm value, with implications for corporate social responsibility', *Academy of Management Perspectives*, 26(4): 1-19.
- Edmans, A. (2020), *Grow the Pie: How Great Companies Deliver Both Purpose and Profit*, Cambridge University Press, Cambridge.
- Galgani, P., R. de Adelhart Toorop, R. and A. de Groot Ruiz (2020), 'Monetisation Factors for True Pricing Version 2020.1', True Price, Amsterdam.
- Greco, S., J. Figueira and M. Ehrgott (2016), *Multiple Criteria Decision Analysis*, Springer, New York.
- Hallerbach, W. and J. Spronk (2002), 'The relevance of MCDM for financial decisions', *Journal of Multi-Criteria Decision Analysis*, 11(4-5): 187-195.
- International Integrated Reporting Council (2013), 'The international <IR> framework', London.
- Kaplan, R. and D. Norton (1996), *The Balanced Scorecard: Translating Strategy into Action*, Harvard Business School Press, Boston.
- Kaplan, S. (2020), 'The Enduring Wisdom of Milton Friedman', in: L. Zingales, J. Kasperkevic and A. Schechter (eds), *Milton Friedman 50 Years Later*, ProMarket & Stigler Center, Chicago, 4-6.
- Krueger, P., D. Metzger and J. Wu (2020), 'The Sustainability Wage Gap', European Corporate Governance Institute – Finance Working Paper 718/2020, available at: <https://ssrn.com/abstract=3672492>.
- Kurzack, L., D. Schoenmaker and W. Schramade (2021), 'A Model of Long-Term Value Creation', *Journal of Sustainable Finance & Investment*, forthcoming.
- Lima de Miranda, K. and D. Snower (2020), 'Recoupling Economic and Social Prosperity', *Global Perspectives*, 1(1): 1-29.
- Lins, K., H. Servaes and A. Tamayo (2017), 'Social capital, trust, and firm performance: The value of corporate social responsibility during the financial crisis', *Journal of Finance*, 72(4): 1785-1824.
- Mayer, C. (2018), *Prosperity: Better Business Makes the Greater Good*, Oxford University Press, Oxford.
- McElroy, M. and M. Thomas (2015), 'The MultiCapital Scorecard', *Sustainability Accounting, Management and Policy Journal*, 6(3): 425-438.
- Mukhlynina, L. and K. Nyborg (2020), 'The Choice of Valuation Techniques in Practice: Education versus Profession', *Critical Finance Review*, 9(1-2): 201-265.

- Neumayer, E. (2013), *Weak versus Strong Sustainability: Exploring the Limits of Two Opposing Paradigms*, Fourth Edition, Edward Elgar, Cheltenham.
- Parmenter, D. (2015), *Key Performance Indicators: Developing, Implementing, and Using Winning KPIs*, 2nd edition, John Wiley & Sons, New Jersey.
- Philippon, T. (2019), *The Great Reversal: How America Gave Up on Free Markets*, Harvard University Press, Boston.
- PwC (2013), 'Measuring and managing total impact: A new language for business decisions', London.
- Raworth, K. (2017), *Doughnut Economics: Seven Ways to Think Like a 21st-Century Economist*, Random House Business Books, London.
- Schoenmaker, D. and W. Schramade (2019), *Principles of Sustainable Finance*, Oxford University Press, Oxford.
- Schramade, W. (2020), *Duurzaam kapitalisme. Een andere kijk op waarde*, Bertram + de Leeuw, Haarlem.
- Serafeim, G., R. Zochowski and J. Downing (2019), 'Impact-Weighted Financial Accounts: The Missing Piece for an Impact Economy', White Paper, Harvard Business School, Boston.
- Servaes, H., and A. Tamayo (2013), 'The impact of corporate social responsibility on firm value: The role of customer awareness', *Management Science*, 59(5): 1045-1061.
- Steffen, W., K. Richardson, J. Rockström, S. Cornell, I. Fetzer, E. Bennett, R. Biggs, S. Carpenter, W. de Vries, C. de Wit, C. Folke, D. Gerten, J. Heinke, G. Mace, L. Persson, V. Ramanathan, B. Reyers and S. Sörlinet (2015), 'Planetary boundaries: Guiding human development on a changing planet', *Science* 347(6223): 736-47.
- Sterling P. (2004), 'Principles of allostasis: optimal design, predictive regulation, pathophysiology, and rational therapeutics', in: J. Schulkin (ed.), *Allostasis, Homeostasis, and the Costs of Physiological Adaptation*, Cambridge University Press, Cambridge, 17-63.
- Stiglitz, J., A. Sen and J.P. Fitoussi (2009), 'Report by the Commission on the Measurement of Economic Performance and Social Progress', Stiglitz report, Paris.
- Tirole, J. (2001), 'Corporate Governance', *Econometrica*, 69(1): 1-35.
- True Price (2020), 'Principles for True Pricing', Amsterdam.
- Kahneman D. and A. Tversky (1979), 'Prospect Theory: An analysis of decision under risk', *Econometrica*: 47(2): 263-291.
- Van den Bergh, J. (2010), 'Externality or sustainability economics?', *Ecological Economics*, 69(11): 2047-2052.
- Weitzman, M. (2009), 'On modeling and interpreting the economics of catastrophic climate change', *Review of Economics and Statistics*, 91(1): 1-19.