

Erasmus Platform for Sustainable Value Creation

Working paper

A model of long-term value creation

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Abstract

Companies need to rethink the way they create value and grow their business to thrive in tomorrow's volatile and uncertain business environment. Companies in virtually every industry are being impacted by new disruptive and complex societal trends, such as climate change, energy transition and social inequality. At the same time, companies are increasingly evaluated on their non-financial performance and they ever more compete on speed and sustainability.

Still, only a few companies have begun to invent new strategic directions, pioneering strategies focused on creating long-term value, not just for shareholders but for all stakeholders. A playbook on how to create long-term value is currently lacking, making it difficult for companies to capture the opportunities and mitigate the risks created by these societal trends.

This paper develops a model of long-term value creation that supports companies in creating long-term value and setting their strategies accordingly. Financial institutions can draw on the model to assess how future proof their investment and/or lending portfolios are.

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1. Introduction

The changing risk and opportunity landscape, combined with the changing role of companies in society and increasing pace of change in the business environment, has created a new normal that requires a fundamental rethink of how companies create value and grow their business. COVID-19, climate change, social inequality and changing demographics are just a few examples of societal issues and trends that are structurally changing the way consumers behave and how companies operate, allocate capital and manage their supply chains (Aggarwal, 2011).

In such a world, historical financial results of companies are becoming less relevant predictors of future success of companies (Schoenmaker and Schramade, 2019). Investors and financiers increasingly want to understand which long-term plans they have in place 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 short-term financial performance. Leading companies of the future tend to be the ones that aim for long-term value creation (LTVC). These companies are able to create both economic and societal value by continuously adjusting their business and operating models to capture opportunities and mitigate risks created by societal trends. In this new business reality, economic and stakeholder value creation are fully integrated. By creating stakeholder value companies create economic value in the future.

Creating long-term value requires a long-term perspective from senior management, the identification of future societal trends that could affect the longer-term competitiveness of the company and a clear long-term vision on how to reshape the business today to master these future disruptions. Geels and Schot (2007) call the latter a “transition pathway”, the strategic blueprint that the company applies to transform today’s business and operating model to capture the business opportunities and mitigate the risks posed by tomorrow’s societal trends.

Currently, many companies struggle with “how” to focus on and create long-term value, often caused by pressures to meet short-term expectations and requirements from shareholders, customers and other key stakeholders. In the current COVID-driven economic downturn it might become even more difficult for companies to invest for the long-term, for example to green their product portfolio, while continuing to survive in the short run (Hepburn et al., 2020).

The aim of this paper is to develop a model of long-term value creation to support companies in creating long-term value. This model is helpful to understand the process of transition, which is differentiated across sectors and individual companies, and can be used as part of the strategic planning process. It also enables assessing the transition preparedness of individual companies and business units across sectors; and identifying frontrunners and laggards. The working of the model is illustrated with examples from different industrial sectors.

Financial institutions can draw on the model to assess how “future proof” their investment and/or lending portfolios are. They can thus identify in which sectors they are invested in the vanguard and in which sectors they are exposed to the laggards. This analysis can be used to adjust their investment and lending strategy.

This paper is organised as follows. Sections 2 and 3 explain the strategic importance of long-term value creation and the required capabilities that companies need to develop. Next, Section 4 presents our model of long-term value creation and Section 5 calibrates the model with some examples. Section 6 concludes with insights from the model.

2. Focus on long-term value creation of paramount importance in future

Today, the shareholder primacy in company strategy and decision-making is increasingly under pressure. An exclusive focus on short-term value maximisation could harm an organisation’s future competitiveness and earning capacity (Mayer, 2018). Accordingly, investors expect a dual focus from companies: on short-term efficiency and on investing to create long-term value for both shareholders and other relevant stakeholders of the company. Increasingly, investors recognise that sources of competitive advantage and market power are shifting and that it is in their own interest that companies focus on long-term value creation for all key stakeholders.

Three key trends can be identified that are driving this change in perspective since the Global Financial Crisis in 2007-2009 and which will continue to shape the future business environment:

a) Changing risk and opportunity landscape of companies

Numerous companies are being impacted by new highly disruptive, unpredictable and complex societal risks and opportunities such as climate change, changing demographics, geopolitical risks, deglobalisation and increasing economic inequality in societies (KPMG, 2019). For example, climate change and the energy transition are increasingly disrupting carbon intensive industries such as oil & gas, mining and chemical industries. The European Commission (2020) aims to mobilise at least € 1 trillion of private and public sustainable investments over the upcoming decade to realise the European green deal.

The COVID-19 pandemic is another example of such a societal issue that is significantly impacting the financial performance of individual companies, sectors and economies at large, such as airline, retail, hospitality and automotive industry. The societal and economic impact of COVID-19 will likely rumble on for many years and could lead to structural changes in, for example, what and how customers consume; and how companies work, allocate capital, manage finances and organise their supply chains. To achieve an appropriate strategic response, companies need to

embrace and understand how these societal risks and opportunities are connected and ensure their boards and leadership teams are engaged over the longer term.

Next to these societal challenges and trends, sources of value creation for companies are shifting to stakeholders as well. Many companies are on the threshold of a shift where the source of value creation lies with customers, employees and broader society rather than with shareholders. We currently live in a world where simple financial capital is abundant (Mankins, Harris and Harding, 2017)), while other types of capital are becoming increasingly important (Haskel and Westlake, 2018). A company's competitiveness and profitability increasingly lie in securing and enhancing stakeholder-related aspects of value such as human capital, natural capital, customer relationships, brands, partnerships and trust. Such intangibles comprise 84 percent of corporate valuations, up from 32 percent in 1985 (Ocean Tomo, 2017).

b) Speed of change increasing dramatically

Driven by technology, the pace of change in how businesses operate and interact with their customers and stakeholders is accelerating. The life span of companies continues to shrink. Research by Innosight (2018) shows that the 33-year average tenure of companies on the S&P 500 in 1964 had narrowed to 24 years by 2016. Companies have to be more agile to identify and commercialise new opportunities through innovation in a constantly moving environment. This does not imply that the long-term is irrelevant. Companies with a stronger long-term orientation are better prepared and better able to adapt. A long-term orientation is typically found in companies owned by families and foundations (Herrmann and Franke, 2002).

In such an increasingly volatile, uncertain and unpredictable business environment an exclusive focus on efficiency and short-term shareholder value maximisation by companies could be risky. Resilience and a longer-term orientation are likely to be more beneficial in such a market place (Holling, 2001).

c) Changing role of companies in society

There is mounting social and political pressure on companies to do more for the good of society (Mayer, 2018). The need for companies to show they are good corporate citizens that add value to customers, employees, suppliers and society has never been greater. In this way, they can retain their social licence to operate. Companies that exclusively focus on maximising short-term shareholder value, optimising dividend pay-outs and share buyback-programs are increasingly scrutinised. It seems that the COVID-19 pandemic has accelerated this trend, with several governments attaching green conditions to government support (Schoenmaker, 2020).

These changing stakeholder expectations and the pursuit of long-term value creation are reflected in recently launched corporate governance codes that in economies such as the Netherlands, the United Kingdom, Austria, Japan and Australia. This shift is also visible in a broadening corporate application of reporting frameworks such as the Integrated Reporting (<IR>) framework of the International Integrated Reporting Council (IIRC) and the TCFD-framework of the Bloomberg Task Force on Climate-related Financial Disclosures. The changes in such governance and corporate reporting frameworks are meant to facilitate the transition from short-term thinking towards long-term value creation for all stakeholders. The public sector also displays rising expectations on the role of companies in society through net zero legislation, green recovery initiatives and carbon taxes.

To anticipate these three key forces and to remain competitive, companies need to start thinking differently about business strategy and the way they create value. Leading companies of the future tend to be the ones that aim for long-term value creation (LTVC), i.e. the ability to align financial value creation with social and environmental value generation.

More and more companies in diverse sectors are currently aiming for LTVC. In the oil & gas sector, for example, BP set a new ambition to become a net zero company by 2050 or sooner, and to help the world get to net zero (BP, 2020). Rio Tinto, one of the largest global mining companies, announced plans in 2020 to invest around \$1 billion over the next five years to support the delivery of its new climate change targets and a company objective for net zero emissions from operations by 2050. And the UK-bank Barclays aims to become a net zero bank by 2050.

To achieve the net-zero objectives, and thus LTVC, these companies need to transform their business and operating models. They recognise that their relevance, competitiveness and earning power on the longer term is inevitably dependent on their ability to reduce the carbon intensity of their existing portfolio while simultaneously upscaling their investments in more sustainable technologies. Investors, financiers and other stakeholders increasingly want to understand which long-term plans these companies have in place to prepare and adjust their businesses to this new reality. However, many companies struggle to define the pathway towards LTVC. The leadership of Rio Tinto, for example, admitted: “The ambition is clear but the pathway is not.....” (Rio Tinto, 2020).

Section 4 develops a model of LTVC to support companies in creating long-term value, besides their significant short-term challenges. The model aims to provide insight on how companies could develop their own so called “transition pathway”, the strategic blueprint that the company could apply to transform today’s business and operating model to capture the business opportunities and mitigate the risks posed by tomorrow’s societal trends. Before that, Section 3 discusses which key capabilities companies need to create long-term value.

3. What do companies need to create long-term value?

The capability of companies to create long-term value is *inter alia* determined by their ability (skillset) to create both economic and societal value simultaneously and their willingness (mindset) to keep investing in the longer-term competitiveness of the company in the face of short-term pressures.

a) Skillset

One of the key skills a company must have is the ability to understand the relationship between economic value and societal value creation (Lepak, Smith and Taylor, 2007). This is a two-way relationship, which is called double materiality. Financial materiality refers to the capability of the company to identify the future societal trends that could affect the development and performance of the organisation (inside-out perspective). Social and environmental materiality concerns the capability to understand the impact of a company's activities on society and nature (outside-in perspective).

This double materiality requires senior managers within the company not to get stuck in the here and now and to think inside-out and outside-in (Dyllick and Muff, 2016). They also need to be able to build and handle scenario planning and stress testing and integrate these capabilities into their strategic planning and risk management framework. For example, they need to be able to understand how their organisations might be impacted by the energy transitions across multiple time horizons, e.g. 3, 5 and 10 years' time horizons (Loorbach and Verbong, 2012).

Next to clearly understanding the relationship between economic and societal value creation, the company must also be able to determine what changes in the business and operating model of the organisation are needed to capture the opportunities created by future societal trends (Schoenmaker and Schramade, 2019). The power to execute the necessary changes in the business and operating model, is another key company capability needed to create long-term value (Kotter, 1995). Creating buy-in from middle-management and employees is crucial to implement the required changes. Performance management and incentive schemes should be aligned to the LTVC-ambitions of the company. In addition, senior management should be able to show to employees that it is performing better by doing good. Quantifying, measuring and communicating the economic value created by focusing on social and environmental value creation is critical to get buy-in from middle-management and employees in the organisation.

b) Mindset

The mindset concerns the awareness and willingness of the company to balance short and long-term company performance by investing, for example, not only in tangible assets, but also in intangible ones such as social, human, natural and intellectual capitals (Rimanoczy, 2017).

Whereas the skillset refers to understanding financial, social and environmental value and their interactions, the mindset is about the preparedness to invest in these three values in an integrated way (Schoenmaker and Schramade, 2019).

Companies which want to successfully compete in today's business environment need to keep in mind that intangibles comprise 84% of corporate valuations (Ocean Tomo, 2017). Investing in customer intimacy, R&D and innovation, the right talent and company culture, minimising environmental impacts of products and services, etc. (i.e. the earlier mentioned capitals) in the face of short-term pressures, is crucial for the long-term competitiveness of companies.

It is critical that both the Board of Directors and Executive Management have such a mindset. The way company success is being managed and monitored depends to a large extent on the extent to which both governing bodies apply "integrated thinking": the mindset that focusses on both short and long-term value creation and investments in both tangible and intangible assets of the company. In addition to alignment between the Board and Executive Management, it is equally important that the company ensures that long-term investors are their ally. Buy-in from long-term investors on the strategic direction of the company is critical for the successful execution of the plans. Ideally, long-term investors are committed to the company with significant stakes, provide feedback to the company and safeguard the company's mission. Leading companies have started to measure and report on economic and societal value creation in an integrated way. Such integrated reports facilitate the communication between companies and investors on long-term value creation.

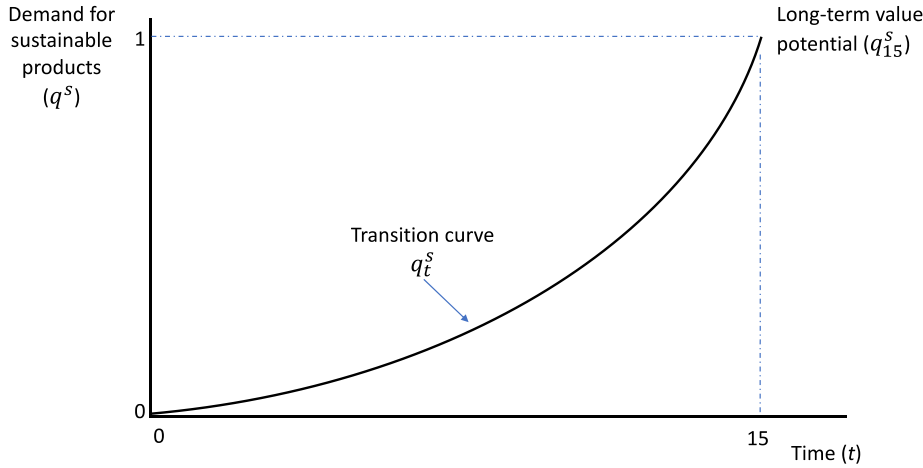
4. The model

As argued in previous sections the business reality of companies in virtually every industry is changing. To win in this new reality, companies need to aim for LTVC: the ability to create both economic and societal value simultaneously. To date, companies struggle to define strategies for LTVC. The purpose of the model presented in this section is to provide companies with tools to create long-term value by helping them to develop their own transition pathway and determine the company's transition preparedness.

We follow the technique of back-casting to model the transition (Loorbach, 2010). This starts with a vision for the future (the long-term value potential at $t = n$), followed by designing a transition pathway (the curve drawn from $t = n$ to $t = 0$) and finally concrete actions at $t = 0$, which involve developing capabilities by investing in social, human, natural, intellectual, financial and manufactured capitals. Figure 1 depicts the company's transition curve towards its long-term value potential (see equation (2) below). The horizontal axis indicates the time in years, while the vertical axis shows the switch of the relevant market from conventional to sustainable products or services. This transition curve is based on transition scenarios.

Figure 1: A sector's transition curve

In drawing this graph, we assumed the following parameter values: $n = 15$, $\gamma = 1$ and $q_0^s = 0$ (the meaning of the parameters is given below)



Note: The horizontal axis indicates the time in years. The vertical axis shows the demand for sustainable products or services in the relevant market.

For the long-term value potential LTV of company i , we use a modification of the standard valuation model:

$$LTV_t^i = \frac{IVF_{t+1}^{s,i}}{r^{s,i} - g^{s,i}} \quad (1)$$

where IVF denotes a company's integrated value flows; r is the discount rate; and g is the growth rate of a company's integrated value flows. The superscript s denotes the transition pathway towards the long-term value potential. The long-term valuation is based not merely on cash flows (to financial capital), but on integrated value flows derived from all capitals (financial, manufactured, intellectual, social, human and natural capital).¹ The company can optimise its LTV by investing in the six capitals (see equation (3) below). The LTV reflects the integrated value of the company for all stakeholders (Schoenmaker and Schramade, 2019).

The long-term value of a company depends on its anticipation of trends in society which shape the markets in the long-term. The market's transition curve, based on transition scenarios, shows the switch to sustainable products, denoted by $q_t^{s,j}$, during the transition period. As transition is

¹ IVF is the sum of financial cash flows (FCFs) and non-financial value flows. The latter would be positive in a value creative company, and hence IVF would exceed FCFs.

a non-deterministic process (Loorbach, 2010), the transition curve is dynamic. Since societal trends become clearer over time and are increasingly adopted by consumers, we take a basic convex function for a sector's transition curve:

$$q_t^{s,j} = \gamma^j \cdot \left(\frac{t}{n}\right)^{1.5} \quad (2)$$

where γ^j denotes the degree of transition of sector j . While the speed of change differs for each market, the choice of power of 1.5 reflects an increased speed of change as discussed in Section 2. Figure 1 shows the curve for the extreme case of $\gamma^j = 1$, where the full sector is in transition from conventional to sustainable products. We typically observe $\gamma^j < 1$, where a sector is partly in transition: $\gamma^j \in [0, 1]$. The transition period moves from $t = 0$ to $t = n$. As a result, $q_n^{s,j}$ is the realisation of the industry's transition to sustainable products and/or services at $t = n$.

A company i can anticipate these societal trends by building capabilities β_t^i to learn about and serve these new societal needs, as part of its strategy. To build capabilities $\beta_t^{i,j}$ in sector j , a company need to invest to varying degrees in social S , human H , natural N , intellectual I , financial F and manufactured M capitals:

$$\beta_t^{i,j} = f(S_t^i, H_t^i, N_t^i, I_t^i, F_t^i, M_t^i) \quad (3)$$

where $\beta_t^{i,j}$ is non-negative with the following range: $\beta_t^{i,j} \in [0, 2]$. $\beta_t^{i,j} = 1$ denotes the hypothetical case in which a company builds exactly enough capabilities to serve the societal needs in its sector, allowing it to reach its long-term value potential in full. The market consensus for a sector's capabilities is typically lower: $\tilde{\beta}_t^j \in \langle 0, 1 \rangle$. A company can adopt a holistic approach in its strategy by balancing its investments in the capitals to build its capabilities. Balancing means that the company respects minimum thresholds for each capital, assuming non-substitutability between the capitals (Lima de Miranda and Snower, 2020; Schramade, Schoenmaker and de Adelhart Toorop, 2021).

The company's position $q_t^{i,j}$ in relation to the sector's transition curve $q_t^{s,j}$ depends on its capabilities $\beta_t^{i,j}$. Using equations (2) and (3), we can derive the company's transition curve:

$$q_t^{i,j} = \beta_t^{i,j} \cdot q_t^{s,j} = \beta_t^{i,j} \cdot \gamma^j \cdot \left(\frac{t}{n}\right)^{1.5} \quad (4)$$

$\beta_t^{i,j} = 0$ is the business as usual scenario, in which the company does not pay attention to societal trends. Except in the absence of transition $\gamma^j = 0$, this puts the company on a costly trajectory. Any deviation of a company's capabilities from the transition curve $q_t^{s,j}$ depresses the company's integrated value IV_t^i in relation to its long-term value potential LTV_t^i . This applies not just to

underinvestment, but to overinvestment as well. In its strategy, a company can move too fast ($\beta_t^{i,j} > 1$), developing products with insufficient buyers or investing in non-winning technologies; or too slow ($\beta_t^{i,j} < 1$), missing business opportunities in newly developing markets. The deviation affects mostly the integrated value flows and their growth potential; and to a lesser extent the discount rate. Please note that $IVF_t^i \leq IVF_t^s, g^i \leq g^s, r^i \geq r^s$.

Denoting the deviation from the sector's transition curve by $|q_t^{s,j} - q_t^{i,j}|$ gives the following value function:

$$IV_t^i = (1 - |q_t^{s,j} - q_t^{i,j}|) LTV_t^i = (1 - |1 - \beta_t^{i,j}| \cdot q_t^{s,j}) \frac{IV_{t+1}^s}{r^s - g^s} = \frac{IV_{t+1}^i}{r^i - g^i} \quad (5)$$

This allows one to determine a company's value for its stakeholders relative to its long-term value potential. A company can optimise its integrated value by building sufficient capabilities to minimise $|1 - \beta_t^{i,j}|$. The latter term reflects the company's distance from the sector's transition curve.

5. Calibrating the model

The model of long-term value creation must be calibrated at different levels. At the macro level, a DESTEP-type analysis can be used to identify the societal trends that shape product and service markets in the long-term (De Ruijter, 2014). DESTEP is a tool to analyse macro-economic trends focusing on demographic, economic, social-cultural, technological, ecological and political-judicial factors. These trends cover the sustainability transitions (social and ecological) and the digital transitions (technology).

While these trends are operating society-wide, their impact is different across various sectors. At the meso level, the transition curve $q_t^{s,j}$ for a sector j can be derived by applying the societal trends to that sector. There are several science-based approaches to constructing transition pathways, in particular for transition scenarios that are compatible with 2⁰ Celsius global warming. The Transition Pathway Initiative (TPI) of the LSE Grantham Institute develops transition pathways for several sectors, such as energy, transportation, materials, manufacturing and consumer goods, to assess companies' preparedness for the transition to a low carbon economy (TPI, 2020). These transition pathways are based on the Sectoral Decarbonisation Approach created by the Carbon Disclosure Project, the World Resource Institute and the World Wildlife Fund (2015). Interestingly, TPI does not only assess companies' carbon performance against the sectoral transition pathway but also companies' management quality by tracking companies' management/governance of carbon emissions and the risks and opportunities arising for these companies from the low carbon transition (TPI, 2020). Another science-based approach is the Paris Agreement Capital Transition Assessment (PACTA) developed by the 2⁰ Investment

Initiative (2018). The PACTA tool calculates the extent to which corporate capital expenditures and industrial assets behind a given equity, bond, or lending portfolio are aligned with various climate scenarios.

These transition pathway methods are based on climate scenarios, which are most urgent. However, they are also quite narrow in scope. An appropriate application of our model would take a broader approach encompassing all societal trends that have a major impact on a particular sector. A materiality matrix is instrumental to identify material issues for each sector (Schoenmaker and Schramade, 2019). In addition, our model calls for a diagnostic assessment of the individual company's risks and opportunities, as well as its capacity building to be prepared for them.

5.1 Strategy of companies

At the micro level, the capabilities of a company $\beta_t^{i,j}$ determine where the company is in relation to its sectoral transition curve. Companies need to design their strategy and adapt their business model to realise the long-term value potential. Companies assess societal trends in order to position themselves on the transition curve.

A successful adaption of the business model requires an appropriate speed of change v and a timely acceleration a at any point in time. The speed of change is the first derivative of the transition curve, given by equation (2), $v_t^{s,j} = 1.5 \cdot \gamma^j \left(\frac{t}{n}\right)$. The acceleration is the second derivative of equation (2) $a_t^{s,j} = \frac{1.5 \cdot \gamma^j}{n}$. The speed and acceleration parameters are important components of a successful strategy. A company that moves too fast exposes itself to the risk of pre-sorting on a non-winning technology. By contrast, a company can fall behind the competitive curve if it moves too slowly. Effective strategy setting requires a subtle interplay of direction (knowing where to go) and timing (knowing when to accelerate) in the building of capabilities and the exercise of the options that result from them.

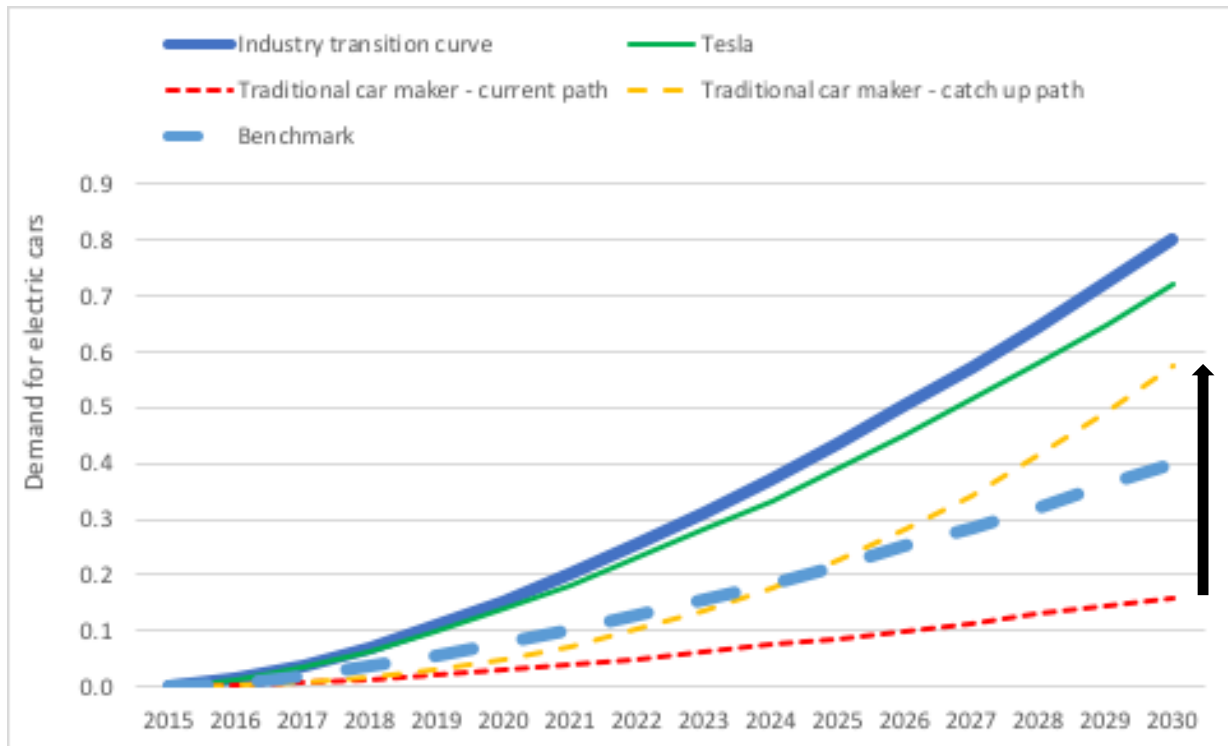
We provide three examples of applying the transition model to companies. Box 1 contrasts the case of a carmaker producing electric cars with the case of a traditional carmaker that has failed to anticipate the rise of electric cars. The traditional carmaker faces the strategic question whether it can and should accelerate its transition $a_t^{i,j}$. Box 2 examines the case of a beverage company improving nutrition and reducing added sugars in its soft drinks, addressing the societal trend of a more sustainable food system. Box 3 considers long-term value creation across business units within a company. Large mining companies, like Rio Tinto, BHP or Glencore, have various business units, ranging from precious metals to coal mining. These mining companies can use our model for long-term value creation to assess and compare the scope of transition γ^j ; and the preparedness for transition $\beta_t^{i,j}$ of the business model of each of their sectoral business units.

Box 1: Transition towards electric driving

Figure 2 depicts the transition curve from 2015 to 2030, assuming a big transition of the car industry ($\gamma^{car} = 0.8$) to electric driving by 2030. The market consensus about the car sector’s capabilities for manufacturing electric cars is: $\tilde{\beta}_t^{car} = 0.5$. Tesla is assumed to be ahead in its capabilities ($\beta_t^{Tesla,car} = 0.9$) and can quickly scale up its production capacity to serve increased demand. Traditional carmakers are behind ($\beta_t^{TC,car} = 0.2$) and lose market share. Some traditional carmakers are catching up at high cost, adding annually 0.04 to $\beta_t^{TC,car}$ since 2018. The difference in capabilities is reflected in the value of both companies: Tesla is 7 per cent ahead of the market consensus in 2020, going up to 53 per cent by 2030 (Figure 3). The traditional carmaker is 5 per cent behind market consensus in 2020, and will go down further to 40 per cent by 2030. This implies that the relative market value of Tesla is expected to be more than twice the market value of the traditional carmaker by 2030. In the catch-up scenario, however, the traditional carmaker accelerates sufficiently its investment in new capabilities to regain ground and realise a value that is 29 per cent above market consensus in 2030. The move from the behind scenario to the catch-up scenario is depicted by a black arrow in Figures 2 and 3.

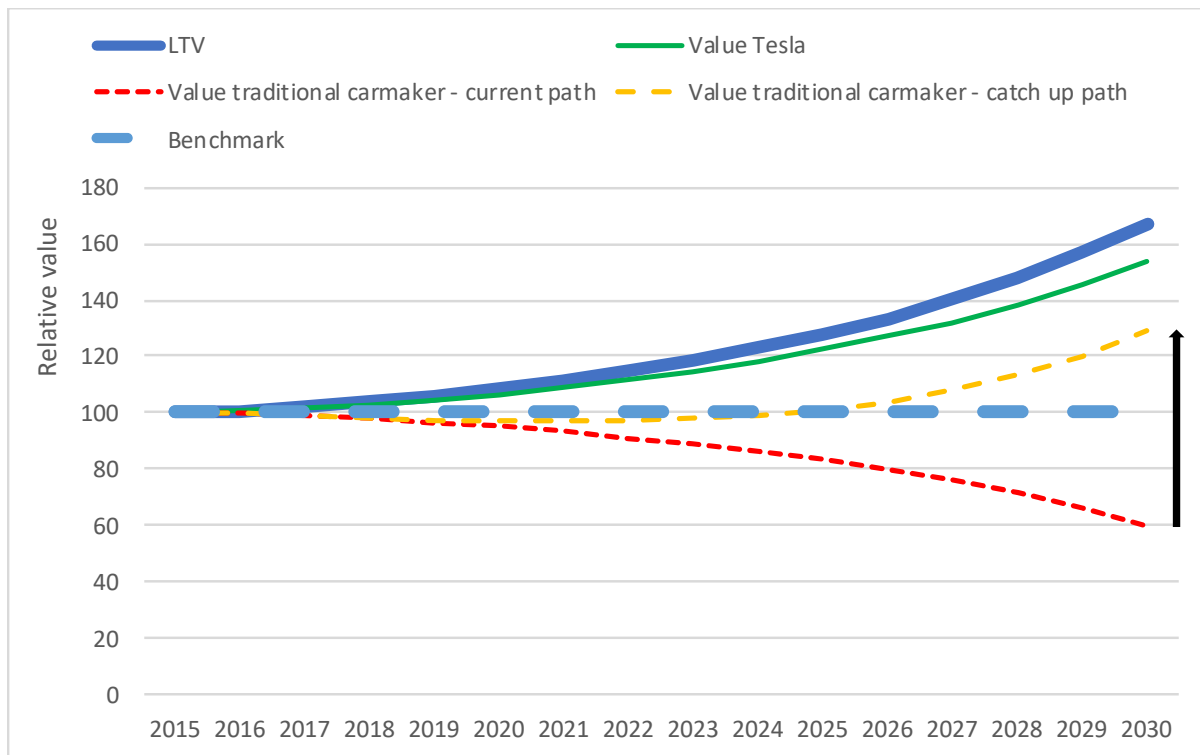
Figure 2: The rise of electric cars in the car industry

In drawing this graph, we assumed the following parameter values: $n = 15$, $\gamma^{car} = 0.8$, $\tilde{\beta}_t^{car} = 0.5$, $\beta_t^{Tesla,car} = 0.9$ and $\beta_t^{TC,car} = 0.2$.



Note: The horizontal axis indicates the time in years. The vertical axis shows the demand for electric cars.

Figure 3: Relative market value of car companies



Note: All market values are rebased to 100 in 2015 (t=0). The market consensus for the industry is the benchmark which remains at 100 till 2030 (t=n). The companies' value as well as the long-term value potential (LTV) are measured relative to this benchmark.

The underestimation of Tesla's capabilities by market analysts means that its long-term fundamental value is not (yet) fully priced in its stock price in 2020.² Over time, this valuation gap is closed as market participants learn and adapt following the adaptive market hypothesis (Lo, 2017).

The difference in capabilities is summarised in the Bloomberg article titled *VW's Boss Warns the Troops: We Don't Want to End Up Like Nokia*: "Volkswagen is at a critical juncture. It has weathered the pandemic relatively well but is fretting about cases going up again. It has electric cars rolling out but is well behind Tesla. And it has massive manufacturing scale but desperately needs to rethink its vehicles as rolling software devices. It is this last issue that CEO Herbert drives home with VW's more than 635,000 employees. The transition in competencies from industrial might to software prowess will be an immense challenge for automakers that are vast, deliberate and some say ripe for disruption. Car companies that get it wrong risk ending up like Nokia – failed hardware makers doomed by more nimble and technologically adept upstarts." (Rauwald, Patel and Thomas, 2020).

² This relates to the development of Tesla's market value in this example. The stock price could be overpriced for other reasons.

Box 2: Transition towards healthy food and beverages

Consumers increasingly ask for healthier and more sustainable food and beverages, and are willing to pay a premium for such products. This trend is impacting the product portfolios of many fast-moving consumer good (FMCG) companies. To capture the business opportunities caused by the transition towards healthy food and beverages, every company in the FMCG sector must answer key questions such as: what innovations to the business model will be necessary? What investments does the company need to make and where? PepsiCo has been one of the first FMCG-companies that anticipated on the transition towards healthy food and beverages. With its 'Performance with Purpose' (PwP) strategy PepsiCo designed already in 2005/2006 its own pathway towards a more healthy product portfolio. It does so by cutting added sugar, salt and saturated fat levels in its products while investing in nutritious foods and beverages.

Box 3: Transition assessment within a mining company

Large mining companies typically have several business units with very different business models. Table 1 provides the parameters for the assessment of the overall mining industry, a fictional mining company, and its three business units. While copper and iron ore are relative stable materials with a relatively low degree of transition (0.2 and 0.4 respectively), coal is undergoing a major transition at 0.9 due to climate policies. In electricity generation, thermal coal is expected to be replaced by alternative energy sources, with the coal market essential limited to that of coking coal (i.e. the type of coal used for steel production) and possibly high-grade thermal coal. The business unit is not well prepared for this phase out, with capabilities at 0.4. The obvious strategy would be to either exit the coal business in one go, or to phase it out without new investments. However, with company management in denial, it effectively keeps its transition capabilities low.

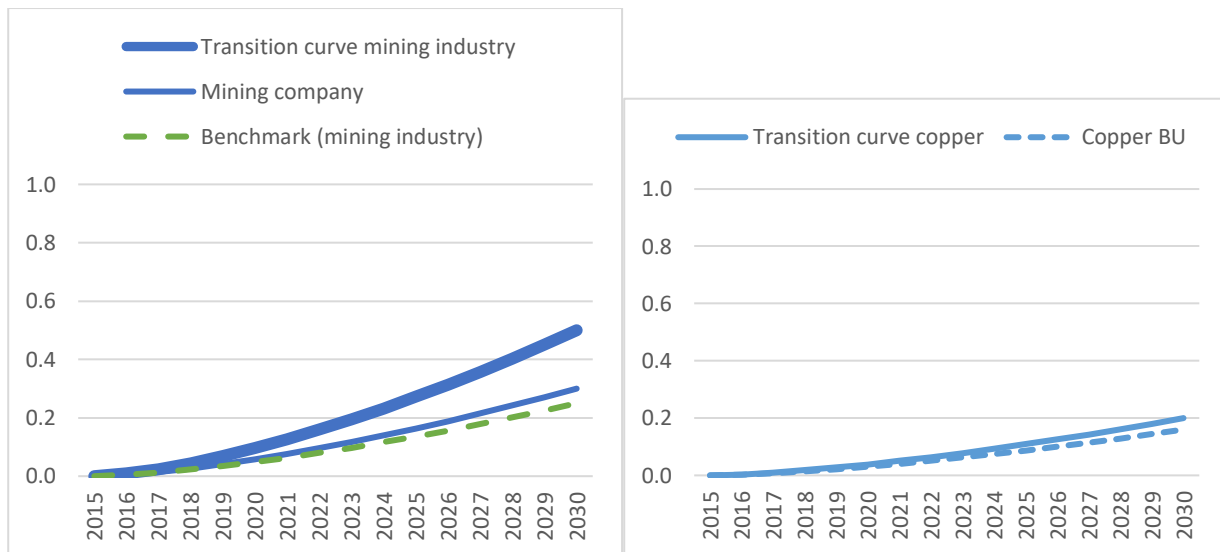
Compared to the coal unit, the company's iron ore business and especially its copper business have stronger capabilities to deal with much milder degrees of transition. As a result, the company has a decent overall level of capabilities (0.6), which masks the weakness in its coal business at company level.

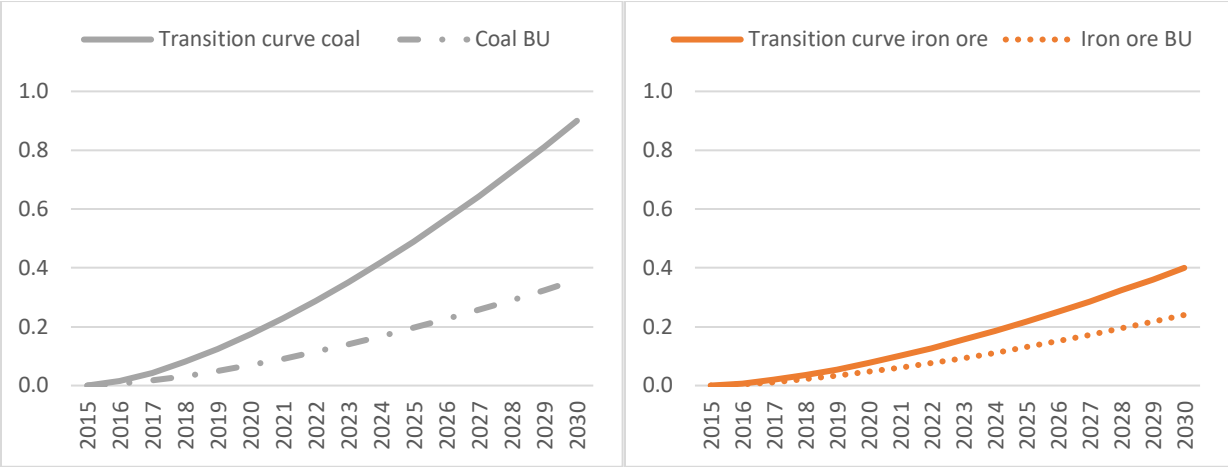
Table 1: Parameters for mining

Sector/business unit	Transition: γ	Capabilities: β	Explanation/examples
Mining industry	0.5	0.5	Reflects all mining companies, which are facing a moderate transition and moderate preparedness on average – but with high underlying variation
Mining company	0.5	0.6	Reflects all three business units; moderate transition in line with the industry; but slightly better prepared
Copper business unit	0.2	0.8	The copper unit is well prepared for a minor transition. It is industry-leading in terms of cost, safety, and logistics.
Coal business unit	0.9	0.4	The coal unit is ill-prepared for a major transition. This might reflect a high cost base and limited optionality and innovation. Low capabilities in a major transition are a clear red flag.
Iron ore business unit	0.4	0.6	The iron ore unit is reasonably well prepared for a mild transition, but it could do a lot better

Figure 4 shows the transition curves. As said, coal is the most disrupted sector within the relative stable mining industry, and the business unit’s low level of capabilities in a major transition is a clear red flag. Figure 5 shows the impact on the market value of the business units. The value of coal business unit is expected to decline by about 40%. This analysis allows the management of the mining company to compare and better manage its business units. The company will need to develop a strategy for dealing with its coal business unit, as doing nothing would severely destroy value. Investors can also use this transition analysis for engagement questions for the mining company.

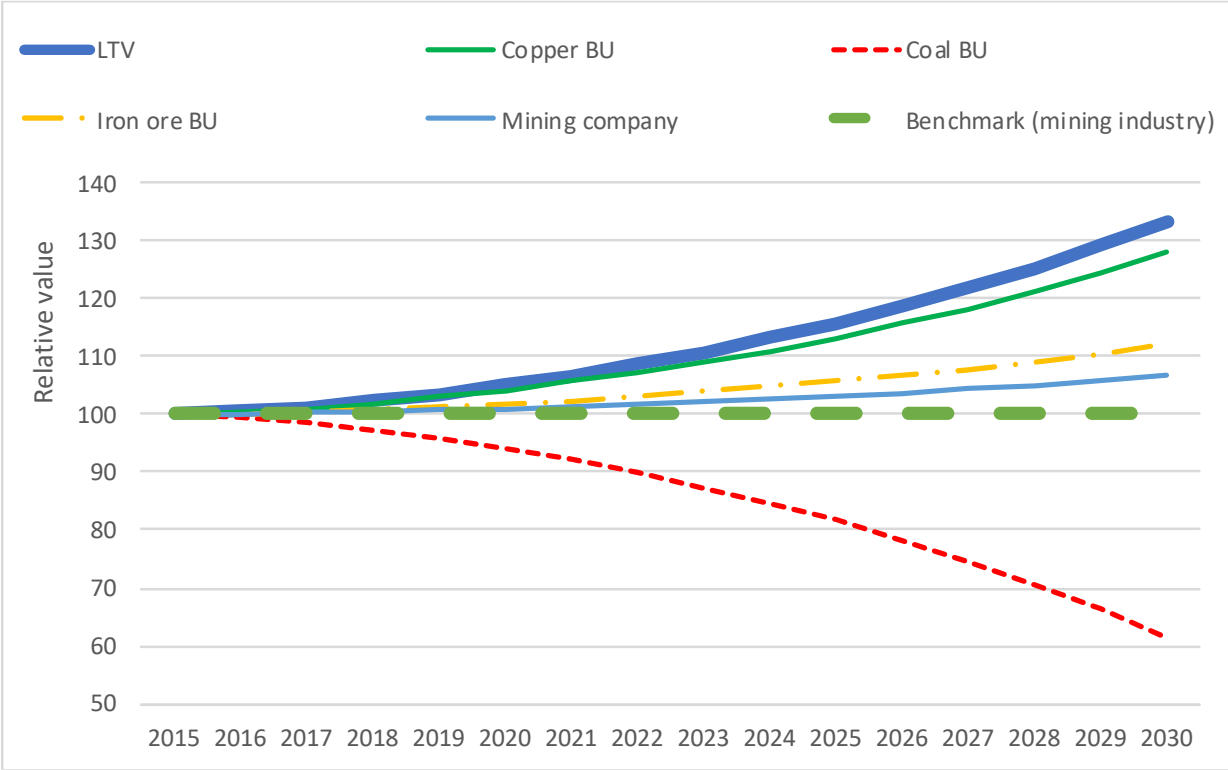
Figure 4: Transition of sectors within the mining industry





Note: The horizontal axis indicates the time in years. The vertical axis shows the transition for the mining company as well as the respective business units.

Figure 5: Relative market value of mining business units



Note: All market values are rebased to 100 in 2015 (t=0). The market consensus for the industry is the benchmark which remains at 100 till 2030 (t=n). The companies' value as well as the long-term value potential (LTV) are measured relative to this benchmark.

5.2 Application by investors/lenders

Sustainable investors select companies that aim for long-term value creation. The adaptive markets hypothesis suggests that price discovery (and underlying valuation) depends on the number and quality of long-term value analysts (Lo, 2017). By analysing societal trends and transition scenarios for particular sectors $q_t^{s,j}$, these analysts acquire information, which enables them to approximate these sectors' transition curves. Next, analysts assess a company's position versus its sectoral curve $\beta_t^{i,j}$, which reflects the company's transition preparedness.

An example of such analysis is the value driver adjustment approach, which examines the impact of societal trends on a company's value drivers: sales growth, sales margin and cost of capital. It follows a three-step approach towards integrating sustainability into fundamental equity investing (Schramade, 2016):

1. identify and focus on the most material societal issues in a particular sector;
2. analyse the impact of these material factors on the individual company;
3. quantify competitive advantages to adjust for value driver assumptions.

Investors and companies also exchange ideas on societal trends; the translation of these societal trends towards the company's sector $q_t^{s,j}$; and this company's capabilities $\beta_t^{i,j}$. The aim of engagement is to stimulate companies to be close to the optimal curve: minimising $|1 - \beta_t^{i,j}|$. This in turn increases the integrated value of the company IV_t^i

Moving to banking, sustainable lenders are like sustainable investors in that they are looking for their borrowers to adopt LTVC (Impact Institute, 2020). The closer a borrowing company is to the optimal curve, the higher the value flows (IVF and g) and the lower the risk (r). This justifies a lower cost of capital (i.e. lower credit spread) for more sustainable companies (Chava, 2014).

Finally, banks and investors can position their clients in relation to their respective sectoral transition curve. They thus construct a transition diagram for each sector, which shows how advanced their investee companies are in that particular sector, identifying frontrunners and laggards. This information can in turn be used for analysing the credit risk and valuation of those companies. Laggards will get accordingly higher interest rates and lower valuations. At the portfolio level, financial institutions can use this information to adjust the sectoral and country allocations in their lending and investment portfolios.

Box 3 provides the example of a bank that has a substantial exposure to the energy sector. The model can be used to analyse and optimise the allocation between traditional energy and renewable energy loans.

Box 3: Bank lending allocation based on transition analysis

Banks have lending exposures to various sectors. In this example, the exposure to the energy sector is analysed. The energy holdings are split in fossil fuel holdings (15% of total portfolio) and renewable energy and circular holdings (5%). Table 2 provides the portfolio weights. Climate policies with reduction targets for carbon emissions mean that the fossil fuel market is much in transition (0.9). The renewable market segment is less in transition (0.5). The bank's capabilities in selecting and monitoring renewable and circular projects and companies are well-developed ($\beta=0.9$). However, in fossil fuels the bank adopts a more or less business as usual approach by lending to traditional fossil fuel companies ($\beta=0.3$). Figure 6 illustrates the transition in the various portfolio holdings. Table 2 also provides the parameters for the rest of the bank's portfolio and the bank market.

Table 2: Parameters for bank portfolio

Portfolio	Weights	Transition: γ	Capabilities: β	Relative value
Fossil fuel holdings	15%	0.9	0.3	-55%
Renewable/circular holdings	5%	0.5	0.9	+17%
Rest of bank portfolio	80%	0.3	0.4	+1%
Total bank portfolio	100%	0.4	0.4	-7%
Bank market		0.4	0.5	0%

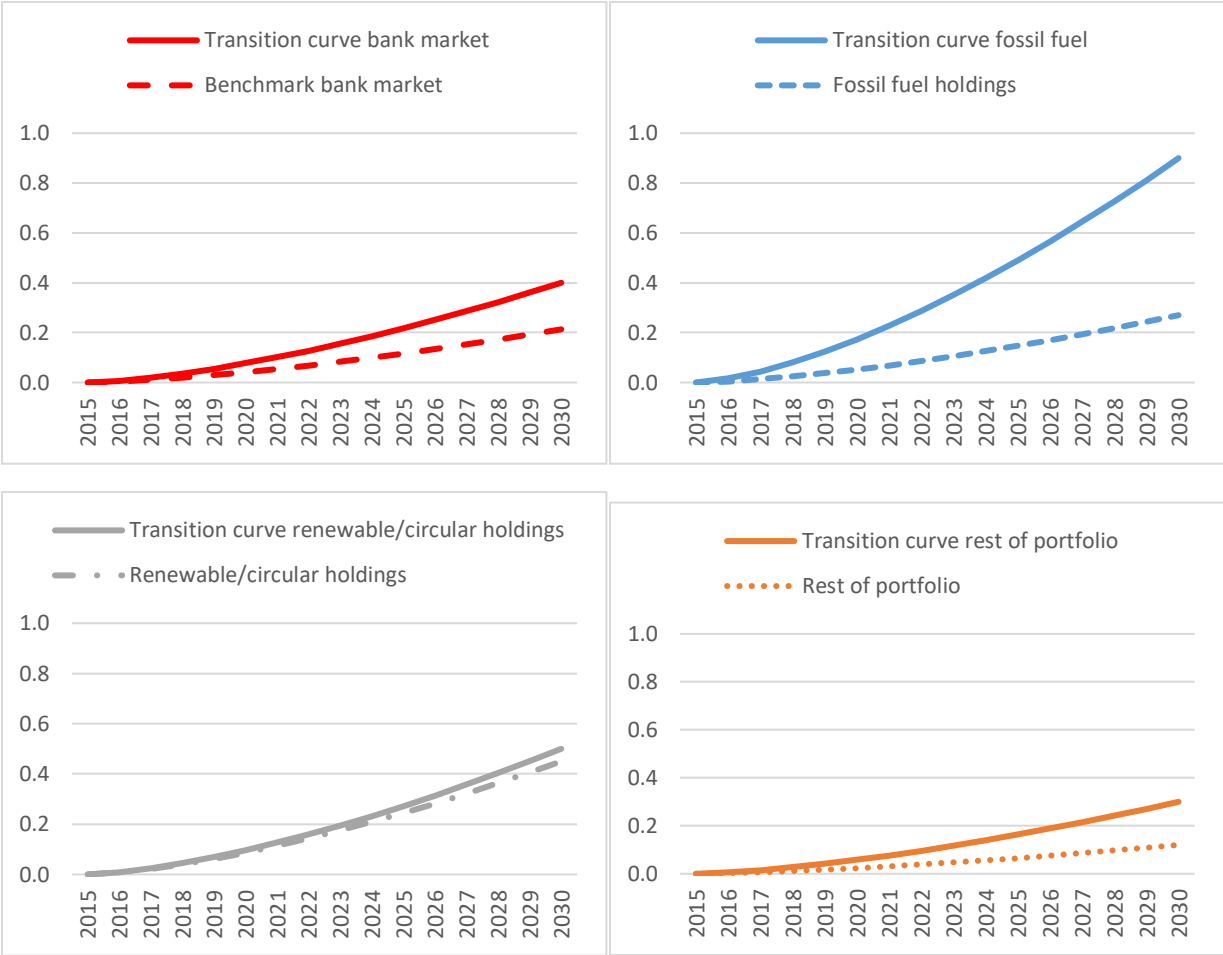
Note: The relative value is the decline or increase relative to the bank market from 2015 (t=0) to 2030 (t=n).

The final column of Table 2 and Figure 7 highlight the value impact of the bank's portfolio holdings as well as the bank's total portfolio. The negative return on the bank's portfolio of minus 7% relative to the bank market from 2015 to 2030 is caused by its large fossil fuel holdings, which are losing 55% of their value due to the bank's business as usual approach in fossil fuel lending. Although renewables have a high return at 17% (due to the bank's high capabilities to select transformative companies and projects in this lending segment), they cannot make up the losses from fossil fuels because of their small base in the portfolio.

The 7% underperformance in value on the bank's portfolio relative to the bank market has an impact on its shareholders, who absorb the losses. The 7% loss of company value could wipe out the bank's equity capital, which is typically 5 or 6% of total assets. However, the losses are not taken at once, but realised over a 15-year period. This would nevertheless lead to reduced dividends and/or rights issues to meet capital requirements.

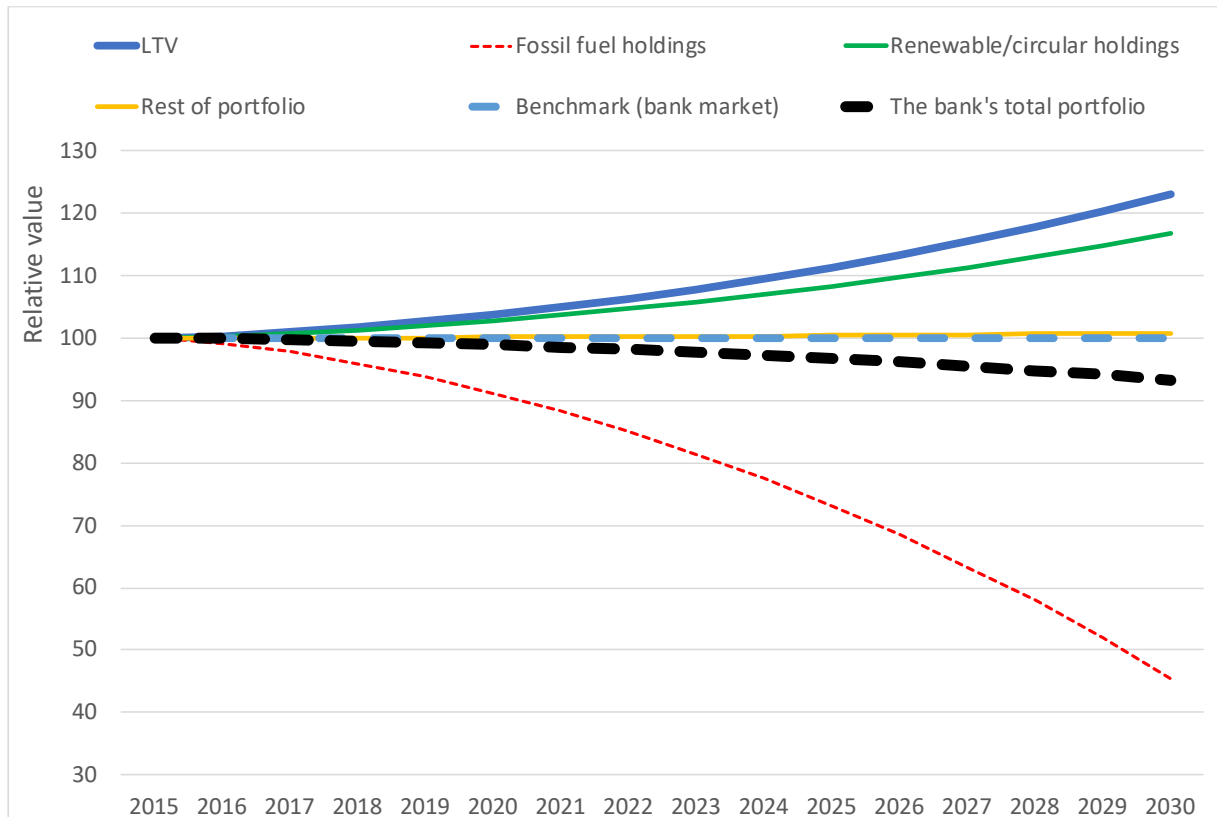
The bank CFO can use this transition analysis to examine which activities contribute to the bank’s earnings and which assets are eroding. It also allows the CFO to classify clients and businesses on their contribution to, or erosion of, the capitals (as specified in equation 3). The bank can accordingly engage with its clients on transition management and strategy. With clients that make insufficient progress, the bank can end the relationship.

Figure 6: Transition in a bank’s lending portfolio



Note: The horizontal axis indicates the time in years. The vertical axis shows the transition for the bank’s lending portfolio as well as the respective sectoral lending exposures.

Figure 7: Relative market value of portfolio holdings



Note: All market values are rebased to 100 in 2015 (t=0). The market consensus for the bank market is the benchmark which remains at 100 till 2030 (t=n). The bank’s portfolio value as well as the long-term value potential (LTV) are measured relative to this benchmark.

6. Insights from applying the model

The calibration of the model provides some interesting results. These differ across sectors, as the degree and speed of transition is sector dependent. The examples illustrate that value differences between companies can become very substantial when the degree of transition in a sector is high and the variation in transition preparedness among companies is also high. What insights does the application of the model offer? How can companies and their financiers use the model?

For companies, the model promotes a strategic focus on societal trends. Dyllick and Muff (2016) argue that companies need to develop an outside-in perspective by asking how they can contribute effectively to solving social and environmental challenges and how these challenges could impact their future competitiveness (instead of looking inside out by asking how they can reduce their negative social and environmental impact). This outside-in perspective allows companies to take a system approach towards societal trends.

Next, the model provides input for companies' strategic planning. It highlights which capabilities companies need to develop in order to achieve the long-term value potential in their sector. The model shows important value differences in case of a shortfall to anticipate societal trends (strategy setting) and/or to build capabilities to cater for these trends (strategy execution). These shortfalls are red flags for management to act upon and could ultimately threaten the long-term survival of the company.

The model suggests an active role for companies. The Board of Directors and Executive Management are in the driving seat of a company's long-term strategy. This raises the question whether the board has the skills in its team as well as the mindset to grasp LTVC. Our model of LTVC forces managers to think away from business as usual and adopt transition thinking, making innovation and experimentation more likely (Loorbach, 2010; Schoenmaker and Schramade, 2019). It compels a company's management team to think what capabilities the company really needs; and where the company needs these capabilities most – namely where the transitions are large and the current capabilities are minimal.

Financial institutions can apply the model at several levels. Like companies, they can apply it to their own business units. But the model also helps them to structure and deepen their sectoral analysis. And it facilitates making a competitive analysis of investee and borrowing companies in their investment and lending portfolios. The focus on (lack of) long-term value potential can steer the investment and lending process. Long-term oriented investors and banks can thus use our model to allocate funding to the frontrunners and move away from the laggards. They can also use the insights from the model in their engagement to strengthen the transition at the frontrunners and to speed up change at the laggards, enhancing societal value creation (Dimson, Karakaş, and Li, 2015). In these ways, the financial sector can accelerate the transition to sustainable development. The financial system would then play its fundamental role of societal allocation of funding (Schoenmaker and Schramade, 2019).

Finally, our model provides insights for regulators. Prudential rules are currently designed on market-oriented practices, whereby the rapid liquidation of positions can limit losses. Liquid investments have lower capital requirements in that system. Our model challenges that logic. Long-term investment and banking imply that financial institutions, on the basis of extensive analysis, enter into long-term relationships with companies in order to jointly promote the transition to business models and products, that create financial and societal value.³ The quality of the (transition) analysis and the risk management procedures are important determinants of future cash flows, which are in turn relevant for calculating adequate capital requirements rather than the speed at which companies can be 'sold'.

³ This reasoning also applies to financing (large) projects, such as infrastructure projects for the energy and transport transition. These are long term, illiquid investments and loans.

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