DOI: 10.2478/ie-2023-0017

Forum

sciendo

Intereconomics, 2023, 58(2), 79-86

JEL: D22, O33, Q01, Q53, Q55

Sarah Lichtenthäler and Adriana Neligan

How Circular Are Businesses in Germany?

A low-carbon economy could be more readily achieved by improving resource efficiency and thinking in cycles. Consequently, we need a new understanding of economic activity and an alternative approach to raw materials. This requires the increased integration of alternative materials – for example secondary raw materials – into the value chain. The efficient use and recycling of materials and energy as well as the substitution of certain raw materials also play a crucial role for Europe's industry.

The concept of a circular economy is strongly integrated in the European growth strategy, the European Green Deal (European Commission, 2019), and is seen as a prerequisite for achieving targeted climate neutrality by 2050. The European Union's Circular Economy Action Plan (European Commission, 2020) pushes regenerative growth and provides the framework for sustainable products, services and business models. The design and circularity in production processes, in particular, forms a critical element.

The transition towards a fully functioning circular economy is only in its early stages, both at the national and at the European level. The circular use of materials in the EU, i.e. the proportion of total material input that is recovered and fed back into the economy as secondary raw material, is about 12% (Eurostat, 2023). Yet, there is great potential arising from a circular economy: in addition to higher resource efficiency, a functioning circular economy can significantly reduce greenhouse gas emissions. Enkvist and Klevnäs (2018) see mitigation potential in the recycling of materials, efficient use of product materials and new circular business models to reduce annual industrial emissions in the EU alone by 56% by 2050. The concept of a circular economy is also becoming increasingly relevant for the alignment and success of corporate strategies. Besides ecological effects, a true circular economy offers economic potential, for example in the form of increased value creation or employment. According to Deloitte and The Federation of German Industries (2021), this could lead to additional gross value added of €12 billion annually until 2030.

Open Access funding provided by ZBW – Leibniz Information Centre for Economics.

Sarah Lichtenthäler, German Economic Institute (IW), Cologne, Germany.

Adriana Neligan, German Economic Institute (IW), Berlin, Germany.

The objective of this study is to identify strategies and measures that can transform current business models into circular business models based on the available literature and quantify them through a unique data set using a company survey.

Theory on circular business models

The basic concept of a circular economy is to use resources for as long as possible by minimising the material and energy demands as well as the waste and emissions of an economic system (Geissdoerfer et al., 2017; Neligan et al., 2022). It focuses on the entire value chain or the complete product life cycle: this includes the extraction of raw materials, the product design, the manufacturing of semi-finished and finished goods and products as well as the use and subsequent recycling of materials. Ideally, products are designed for the longest possible lifetime, reuse and recycling, and appropriate raw materials are used during the design phase. This enables the reuse, refurbishment or return of products to the material cycle at the end of their lifetime. Product and service systems need to be adapted to this, and there is scope for new business models to meet these requirements (Deloitte and The Federation of German Industries, 2021). Well-functioning markets for secondary raw materials as an essential pillar of a circular economy have to operate across borders to ensure demand. The goals of a circular economy are to optimise and prolong the use of resources and ultimately to return and reuse resources in a closed loop.

Circular business models can make a significant contribution towards implementing a circular economy and integrating cycle-oriented business practices in firms. The approaches go beyond the sustainable design of individual elements, such as individual processes or products. In addition, they pursue a holistic corporate strategy focused on circularity. Various terms and definitions for such a corporate strategy exist in the literature. They vary with regard to the different perspectives and analytical

approaches adopted and elaborated. While some focus on the role of market participants in their transition to a circular economy (e.g. Acatech et al., 2020), others focus on the distinction between a production model and a service model (e.g. OECD, 2019a), and still others focus on circular business practices (e.g. European Environment Agency, 2021). Furthermore, the terms and definitions used vary in their scope, and circular business models are usually not defined directly. Instead, they are described by identifying the characteristic properties relevant for the transition from a linear to a circular business model. A brief overview is provided below.

Business model is used to describe how a company conducts its business (Osterwalder and Pigneur, 2005). The creation, retention and provision of value by the company stand at the core of the concept (Osterwalder and Pigneur, 2010). Most significantly, it is about how a company embeds its value proposition, value architecture and revenue model into its competitive strategy (Rasmussen, 2007). The general assumption is that companies set profit maximisation as their goal, which is realised by minimising costs and increasing sales. Resources are considered an infinitely available input factor. This results in a linear economy in which goods are disposed of after single use and economic growth is linked to resource consumption (Deloitte and The Federation of German Industries, 2021).

Business model innovations for sustainability have a positive impact on the environment or the society or reduce existing negative impacts accordingly (Bocken et al., 2014). Geissendoerfer et al. (2018) define sustainable business model innovations as the design and implementation of sustainable business models. This may involve the development of entirely new business models, the diversification into additional business models, the acquisition of new business models, or the transformation from one business model to another. The Organization for Economic Cooperation and Development (OECD, 2019a) identifies the efficient and sustainable use of natural resources as a characterising feature of circular business models that can be achieved through fundamental adjustments to production and consumption patterns. The European Environment Agency (EEA, 2021) defines circular business models as those that close material loops and take the perspective of entrepreneurs and policymakers.

In a circular economy, the assumption of infinite resource availability is changed. Resources are a scarce commodity, as confirmed by various studies on resource availability (e.g. OECD, 2019b) as well as the current shortage of raw materials. Companies are no longer maximising profits only by minimising costs and increasing sales, but additionally by maximising the lifetime of products and resources, thereby minimising resource use as well as waste generation (Ellen MacArthur Foundation, 2013).

The definition of circular business models is one that focuses on enabling, closing, creating or extending circularity by preserving value for as long as possible and saving resources while maintaining competitiveness.

Structure of circular business models

To classify the measures for implementing circularity as well as the goals behind circular business models, an understanding of their basic structure is required. Circular business models are made up of various components that are in line with the goals of a circular economy. This is achieved by various measures taken at different phases of the value chain through restructuring, innovating and exploiting new areas. Following the Ellen MacArthur Foundation (2013), this study identifies four basic theoretical strategies for implementing a circular economy in businesses that can be categorised along the value chain (see Figure 1):

Closing cycles. This strategy aims to close the gap between the end of a product's life cycle and the material input factor for its production. Closing loops can occur both in a very short route, e.g. by remanufacturing, and in a longer route, e.g. by using secondary raw materials as input factors for new products.

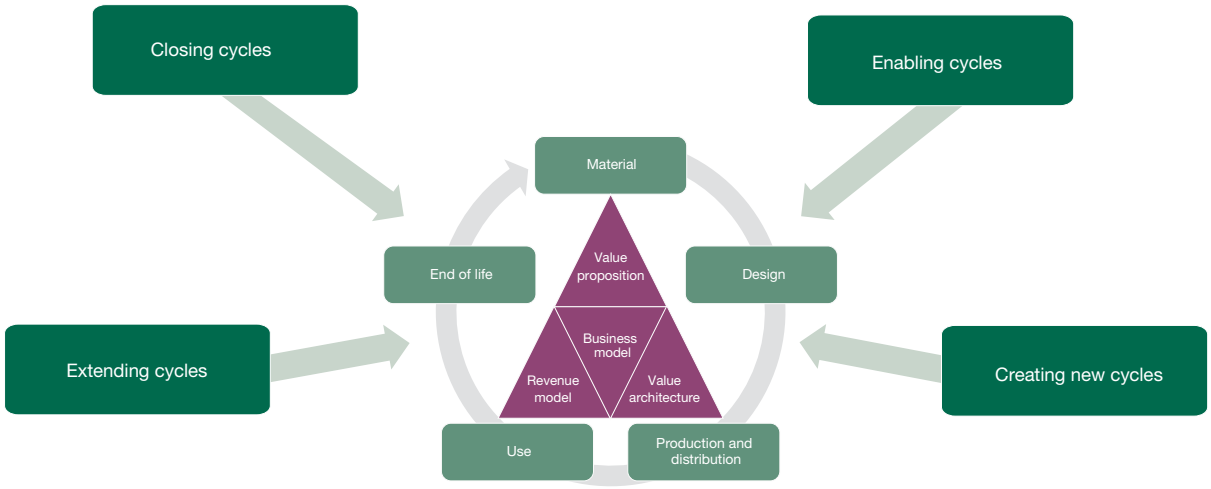
Enabling cycles. This strategy incorporates circularity in the planning, development and design of products. By applying eco-design, both energy efficiency and material composition can be controlled and improved.

Creating new cycles. The purpose of this strategy is to create new circularity options by establishing material or product substitutions that do not yet exist. Instead of being disposed, a waste product from the production of one company can serve as an input for another company.

Extending cycles. This strategy focuses on maintaining value for as long as possible. It is about using products as intensively as possible, which includes sharing them with or passing them on to other users.

Companies do not necessarily have to pursue all strategies simultaneously to have a circular business model. However, there are different forms of circularity in the corporate structure, which depend on various factors, such as the size of the company, the business sector or the field of activity. In addition, the decision whether to implement the strategies holistically or to specialise in individual circular strategies depends on the sector, the

Figure 1
Structure of circular business models



Source: Fluchs et al. (2022).

company's activity, as well as the depth of value creation and the company's position in the value chain. In the case of specialisation of individual circular strategies, a circular economy can be implemented jointly in the value network.

Circular strategies are implemented through specific measures. Some of these measures might require comprehensive restructuring and design of the business process while others are relatively simple to implement. Individual measures can drive different circularity-enhancing strategies within the company, and many companies apply a mix of different measures (OECD, 2019a). The individual components of this system are complex and interdependent; the measures' effects do not unfold in isolation, but rather interact and complement each other.

Transition towards a circular economy

Circular business models must be created and aligned so that an entire economy can ultimately be circular. The complex transition from a linear economy to a circular economy therefore implies the shift of the entire value chain of products with the aim of creating value cycles in which circular business models interact.

Empirical analysis

The aim of this study is to descriptively identify circular strategies in the German manufacturing sector and specific characteristics of similar firms by undertaking a new analysis using two typifications.

Data

The analysis is based on a company survey that took place at the beginning of 2020 as part of the 35th wave of the *IW-Zukunftspanel* survey of the German Economic Institute (IW). This is a regular and long-established online company survey that has been providing answers since 2005 from over 1,000 companies to questions on structural change. The data were specifically collected by the IW for a recent report on resource efficiency and related business models for the German Federal Ministry for Economic Affairs and Climate Action (Neligan et al., 2021). The data includes answers from nearly 600 industrial firms, of which 479 firms are in the manufacturing sector, as well as almost 300 industrial service providers, e.g. wholesale, logistics, information and communication technology (ICT) and other business-related services.

The responses are weighed representatively. Large companies are disproportionately represented in the sample compared to the population. For this reason, a weighting based on the German statistical business register is used to correct for possible size effects. Similarly, the weighting considers that certain industry groups are over-proportionally represented (Neligan and Schmitz, 2017; Neligan et al., 2022).

Typifying companies according to their circular strategy

A typification based on the four circular strategies identified above is established. For this purpose, relevant goals for circular strategies are defined and assigned. The basis

forms a question from the survey on the relevance of 15 objectives of raising resource efficiency. Some of these objectives clearly contribute to one of the four circular strategies, but many objectives are relevant for several circular strategies. Due to strong overlaps in the strategies "creating new cycles" and "enabling cycles" in the definition of goals with the available objectives from the survey, these two strategies are combined into one strategy. As a result, the following empirical analysis looks at three circular business strategies. If a company considers at least one of the three goals relevant to a specific circular strategy to be applicable, it is assumed that a company is pursuing the respective strategy. Furthermore, objectives that have a cross-cutting effect are grouped together. Based on this, a distinction can be made between companies that implement none to three circular strategies. Overarching goals are not considered in the typification. This typification according to circular strategies is based on the formulation of objectives which do not necessarily have to be completely implemented yet. This typification is used to examine different characteristics of companies.

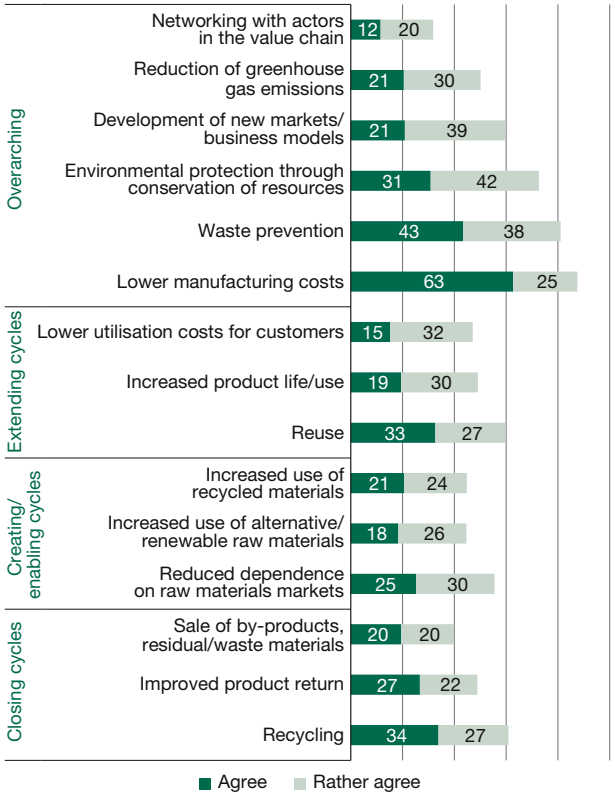
Typifying companies according to their corporate success

An established measure of business success (success index) is used, which is based on regularly surveyed questions in the *IW-Zukunftspanel*. The index includes a component based on information about the company's development in the recent past (company information about employment and turnover development and achievement of company objectives) and another component containing short-term assessments of the future (expectations regarding turnover, employment and investment development). Within each of the two components, the three indicators are weighted equally. In the calculation of the overall index, however, the component with the information on the recent development of the company is given a weight of 70%, while the component with the assessments of future development is given a weight of 30%. Based on this, the companies are divided into three performance groups (low, medium and high success).

Industry's circular objectives and strategies

Companies pursue very different goals regarding resource use, which can be more specific, but also more overarching. Three objectives can be assigned to each of the three circular strategies. Figure 2 shows the relevance of these goals for the German manufacturing sector. For the "closing cycles" strategy, the most important goal is the recycling of raw materials/operating supplies/auxiliary materials, products and product parts. This applies clearly to one-third of the manufacturing sector; for a further quarter it is at least rather applicable. This is followed by goals such as improved product return and the sale of by-products, residual and waste materials. For the strategy "creating/enabling cycles", reducing the dependence on raw materials is at least a somewhat applicable goal for half of the industrial companies. Of these, it is a clear goal for a quarter of the companies. The increased use of alternative or renewable raw materials or of recycled materials is pursued by 45% of firms. For the "extending cycles" strategy, reuse is the most important goal, which three out of five manufacturing companies pursue. One-third of the manufacturing sector also has this goal clearly in focus. Almost half of the industrial companies surveyed state that increasing product life or lower utilisation costs for buyers is a clear or at least somewhat applicable corporate goal. The overarching goals cannot be clearly assigned to any of the three circular strategies. Nonetheless, all aim at an efficient use of resources.

Figure 2
Circular strategies and underlying objectives
in percent of manufacturing firms



Note: Question: Which objectives does your company pursue to increase resource efficiency? Four response categories: agree, rather agree, rather disagree, disagree.

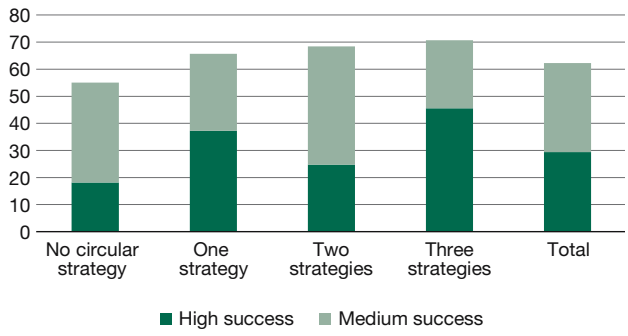
Source: IW-Zukunftspanel (2020); authors' calculations, weighted.

Table 1
Industry's number of circular strategies

Type of strategy	Percent of manufacturing firms
No circular strategy	36.3
One circular strategy	23.4
Closing cycles	5.4
Extending cycles	5.8
Creating/enabling cycles	12.2
Two circular strategies	15.6
Closing cycles and extending cycles	10.5
Extending cycles and creating/enabling cycles	3.9
Closing cycles and creating/enabling cycles	1.2
Three circular strategies	24.7
Total	100

Source: IW-Zukunftspanel (2020); authors' calculations, weighted.

Figure 3
Companies with circular strategies are more successful
in percent of manufacturing firms by circular strategy



Note: Success typification based on a success index: low, medium and high.

Source: IW-Zukunftspanel (2020); authors' calculations, weighted.

Companies do not comprehensively pursue circularity-oriented goals and strategies yet. Only a small share of the companies strive for all three goals, whereas the majority do not include any of the three goals in a particular circular strategy. In each case, almost 60% of the companies see none of the goals for the respective circular strategy as relevant for their company. In the case of the "extending cycles" strategy, 29% of the companies are most likely to aim for one specific goal, while significantly fewer companies aim for two to three goals. For the "closing cycles" strategy, every fourth company pursues only one goal.

Holistic circular strategies in the manufacturing sector are still rare

The classification of companies according to the number of circular strategies pursued shows a mixed picture. It also reflects the untapped potential in firms to further develop existing business models or develop new business models (Table 1). On the one hand, there is a significant proportion of companies in the manufacturing sector that do not have a circular strategy (36%). On the other hand, a quarter of companies either holistically pursue all three circular strategies or instead specialise in one circular strategy. Nevertheless, the companies that holistically both extend, create/enable and close cycles are still a minority. Many companies implement at most one circular strategy. Sixteen percent pursue two circular strategies – including 11% with a focus on both closing and extending cycles. For firms focussing on one circular strategy, every second firm creates/enables cycles. About one in twenty companies focuses on extending or closing cycles.

Companies with circular strategies are more successful

A modern circular economy also holds both ecological and economic potential. Firms with at least one circular strategy are more successful than the ones without any circular strategy (Figure 3). The proportion of companies with medium to high success increases with the number of strategies. While more than one in two industrial companies without a circular strategy records medium to high success, more than two-thirds of companies with at least one strategy do so. Almost every second company with a holistic circular approach (three circular strategies) records high success. Yet, only one-fourth of companies with two circular strategies has high success, compared to almost two-fifths of companies with one circular strategy.

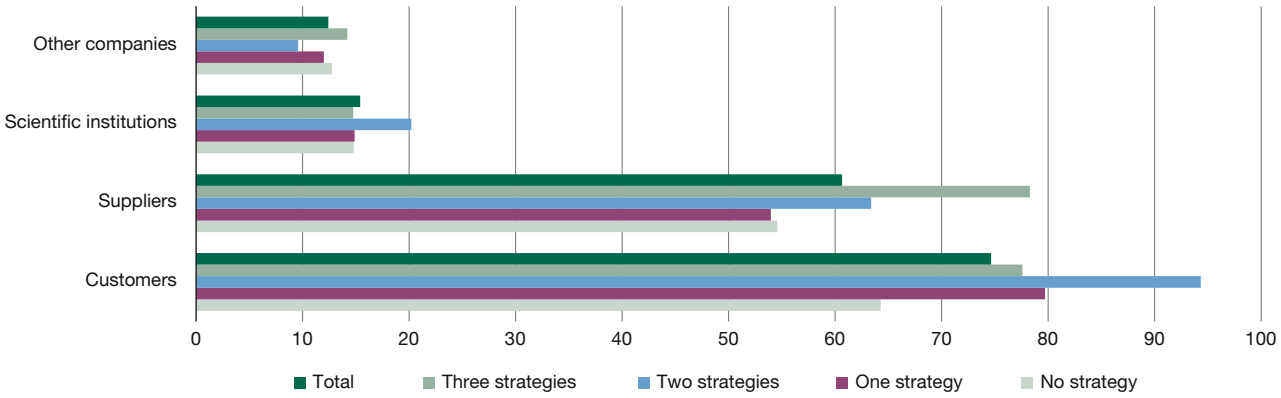
Characteristics of companies depending on their circular strategy

Companies need to consider several dimensions when transitioning to a circular business model with the overall goal of being successful in the market. Possible favourable criteria for circular strategies, which are examined below, are: new business models, markets and networking, innovation networks, research and development (R&D), direct product approaches and internationalisation.

Aiming for new business models and markets and networking

Circular business models need interconnectivity and collaboration. Only a few companies in the manufacturing sector are aiming for new business models and markets or

Figure 4
Innovation networks and circular strategies
in percent of manufacturing firms collaborating (rather) intensively with actors along the value chain by circular strategy



Note: Question: How intensively do you collaborate with the following partners to develop and improve your products/services or processes? Four response categories: intensively, rather intensively, less intensively, not at all.

Source: IW-Zukunftspanel (2020); authors' calculations, weighted.

networking with actors along the value chain. Yet, these can be seen as essential prerequisites for the development of circular business models. One in five industrial companies is striving to develop new markets or business models; further two-fifths claim this rather applies. Half of companies with three circular strategies see new markets and b-usiness models as an applicable goal, while the shares are substantially lower for companies with none or fewer strategies. Very few companies aim to network with important actors along the value chain to improve resource efficiency. Only 12% of companies in the manufacturing sector see this goal as applicable. The share of manufacturing companies that pursue a networking goal increases considerably with the number of circular strategies.

Innovation networks. Innovations are a central element for the transition to a circular economy. In this context, innovation networks play an essential role as a link to stakeholders to promote knowledge transfer and learning processes. Innovation networks with customers play a more important role for companies with circular strategies than for other companies. For product returns after use, customer retention with a regular after-sale contact are essential (Figure 4). Three-quarters of the manufacturing sector cooperate at least rather intensively with their customers in external innovation networks. For companies with two circular strategies, almost all companies cooperate with their customers in this way. For those with a singular circular strategy, it is four out of five. If companies have more than one circular strategy, supplier networks are also relevant for innovation projects. Around three in five industrial companies with two circular strategies work at least rather intensively with suppliers in the development and improvement of their products, services or processes. If three circular strategies are pursued, then four out of five companies do so. About half of companies with no or only one circular strategy claim to work with suppliers in this context. Only rarely do manufacturing companies work at least rather intensively in their innovation projects together with other companies or academia. Nearly three-fifths of the companies do not cooperate at all with the latter. If we look at the companies according to their circular strategies, we see that companies with two circular strategies cooperate mostly with scientific institutions (one-fifth of companies), but much less with other companies (one-tenth of companies).

Research and development. About two-thirds of manufacturing firms engage in R&D at least occasionally. For companies without a circular strategy, it is only every second company. Companies with two circular strategies conduct the most R&D – this is the case in eight out of ten companies, including five out of ten even continuously. The rates are somewhat lower for companies that specialise in one circular strategy or pursue all three strategies holistically. This means that R&D is more likely to be anchored in companies with two circular strategies than in other companies.

Direct product approaches. Direct product approaches – whether through the adaptation of the design or the expansion of the product range in the form of product

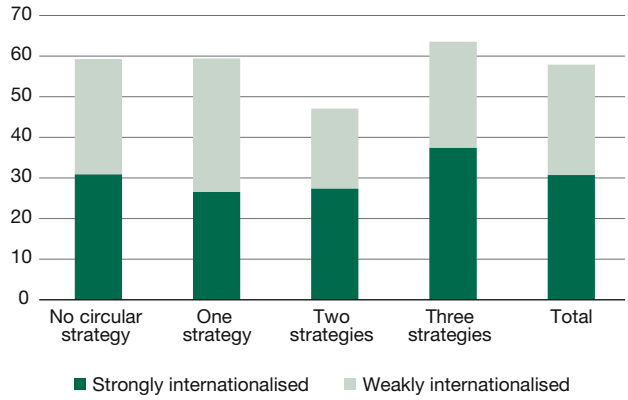
service systems – will become more important for the transition to a circular economy. Yet, they are not widely used to date. Companies with three circular strategies are more likely to use resource-efficient product design than other companies. While only a few companies with no (6%) or only one circular strategy (8%) use resource-saving product design to a high degree, two out of five companies with three circular strategies do. Product service systems are used even less frequently, independent of circular strategies, and no major differences are discernible here depending on the strategy type.

Internationalisation. Well-functioning markets for secondary raw materials form an essential pillar of a circular economy that needs to operate across borders. Companies can operate differently in international markets. They can export goods (weakly internationalised) and/or produce abroad (strongly internationalised). Three out of ten manufacturing companies are strongly internationalised, just over a quarter are weakly internationalised (Figure 5). Two out of five companies are not active in international markets at all. The picture is very similar for companies that do not pursue a circular strategy. It is somewhat different for companies that are already pursuing three circular strategies. Holistic circular strategies go hand in hand with global strategies. These companies are more often internationalised, and more often strongly via foreign production. Companies are particularly rarely internationalised if they have two circular strategies: more than half of these companies are not active on foreign markets at all.

Figure 5

Internationalisation and circular strategies

in percent of manufacturing firms by circular strategy



Note: Weakly internationalised: company is internationally active via exports; Strongly internationalised: company produces abroad.

Source: IW-Zukunftspanel (2020); authors' calculations, weighted.

Conclusion and policy recommendations

A resource-efficient circular economy is a core element on the way to climate neutrality. Besides ecological effects, an efficient circular economy also has economic potential. Hence, it also represents an opportunity for value creation and employment in the overall economy. The survey results show that companies with holistic circular strategies are more successful than other companies. These companies also rely more on networking in the value chain, especially in the development of new products with customers. In addition, they rely on new markets and business models and direct product approaches via design.

Circularity of resources can be realised in different ways in business practice. If holistic circular strategies are pursued, a particularly high awareness of the efficient use of resources and sustainability, but also of overarching goals, is evident. As a result, circular approaches are more likely to be implemented. The realisation of circular strategies can trigger a chain reaction of positive effects for the circular economy.

The implementation and realisation of potential circular business opportunities in practice is just starting. More than one-third of the manufacturing sector does not yet pursue circular strategies. As a result, they do not have circular business models yet. Only one-fourth of manufacturing companies holistically pursue all three circular strategies. Companies do not necessarily need to have all strategies simultaneously to constitute a circular business model. To implement circularity in the entire product life cycle, several companies with circular business models and singular strategies can cooperate accordingly. Depending on the industry, size, depth of value creation and positioning in the value chain, firms can either pursue individual circular strategies or different strategies in parallel in the sense of holistic circularity.

To leverage the potential for an efficient circular economy that encompasses the entire product life cycle, companies can start directly with the product – be it by adapting the design or by offering additional services. Here lie numerous opportunities for more sustainable business models, including circular ones. The strategies of circular business models improve the systemic sustainability performance of the respective companies by using resources more efficiently and thus saving and reducing waste.

A central prerequisite in a circular economy is knowledge both about the upstream stages and about the effects of one's own actions on downstream stages of the value chain. Many companies have not yet set the basic course for a modern circular economy considering the entire

product life cycle. Only rarely do companies aim for a true circular economy or network with actors along the value chain. Data is necessary to evaluate and measure the success of circular business models. Digitalisation is an essential prerequisite, but many companies are not highly digitalised yet (Neligan et al., 2021).

For companies to design higher-value products, keep materials in the cycle, expand the use for products and equipment via sharing or carry out repairs, incentives for innovative circular business models should be strengthened in a practical and market-driven way. For companies, especially small and medium-sized companies (SMEs), to be able to integrate a circular business model into their corporate strategy, advisory and information services can be helpful. Companies need to empower themselves to decide which goals and measures are relevant for the creation of their products and services (Neligan et al., 2021). Policy can provide flanking support through publicly funded offers.

It is also crucial for businesses to have planning security for necessary investments. Various regulations at the European and national level are already providing initial incentives and the regulatory framework to drive the transition to a circular economy, e.g. regarding secondary raw material markets, eco-design, extended producer responsibility, waste avoidance, recycling, remanufacturing and reuse.

Finally, important building blocks of a circular economy are functioning secondary raw material markets, which must be designed on a cross-border basis. This allows circular strategies to actually be implemented and realised in internationally operating networks.

References

Acatech, Circular Economy Initiative Deutschland, SYSTEMIQ (eds.) (2020), *Circular Business Models: Overcoming Barriers, Unleashing Potentials*.

Bocken, N. M. P., S. W. Short, P. Rane and S. Evans (2014), A literature and practice review to develop sustainable business model archetypes, *Journal of Cleaner Production*, 65, 42-56.

Deloitte and The Federation of German Industries (BDI) (2021), Zirkuläre Wirtschaft. Herausforderungen und Chancen für den Industriestandort Deutschland, https://www2.deloitte.com/de/de/pages/sustainability1/articles/zirkulaere-wirtschaft-studie.html (9 May 2022).

Ellen MacArthur Foundation (2013), Towards the Circular Economy Vol 1: Economic and Business Rationale for an Accelerated Transition.

Enkvist, P.-A. and P. Klevnäs (2018), The Circular Economy – a Powerful Force for Climate Mitigation. Transformative innovation for prosperous and low-carbon industry, Material Economics.

European Environment Agency (2021), Business Models in a Circular Economy, Eionet Report, ETC/WMGE 2021/2.

European Commission (2019), The European Green Deal, Communication from the Commission to the European Parliament, the European Council, the Council, the European Economic and Social Committee and the Committee of the Regions, COM(2019) 640 final.

European Commission (2020), *Circular economy action plan: for a cleaner and more competitive Europe*, Publications Office of the European Union.

Eurostat (2023), Circular material use rate, https://ec.europa.eu/eurostat/databrowser/view/env_ac_cur/default/table (22 February 2023).

Fluchs, S., A. Neligan, C. Schleicher and E. Schmitz (2022), Zirkuläre Geschäftsmodelle: Wie zirkulär sind Unternehmen?, *IW-Report*, 27/22.

Geissdoerfer, M., P. Savaget, N. M. P. Bocken, E. J. Hultink (2017), The Circular Economy – A new sustainability paradigm?, *Journal of Cleaner Production*, 143, 757-768.

IW-Zukunftspanel (2020), Regular company survey by the German Economic Institute (IW), 35th wave, January to March 2020.

Neligan, A. and E. Schmitz (2017), Digitale Strategien für mehr Materialeffizienz in der Industrie. Ergebnisse aus dem IW-Zukunftspanel, *IW-Report*, 3/2017.

Neligan, A., B. Engels, T. Schaefer, C. Schleicher, M. Fritsch, E. Schmitz and R. Wiegand (2021), Digitalisierung als Enabler für Ressourceneffizienz in Unternehmen, report on behalf of the Federal Ministry for Economic Affairs and Energy, https://www.iwkoeln.de/studien/adriana-neligan-digitalisierung-als-enabler-fuer-ressourceneffizienz-in-unternehmen.html (30 November 2022).

Neligan, A., R. J. Baumgartner, M. Geissdoerfer and J.-P. Schöggl (2022), Circular disruption: Digitalisation as a driver of circular economy business models, *Business Strategy and the Environment*, 1-14.

OECD (2019a), Business Models for the Circular Economy: Opportunities and Challenges from a Policy Perspective, Re-circle Resource Efficient & Circular Economy Project, OECD Publishing.

OECD (2019b), Global Material Resources Outlook to 2060: Economic Drivers and Environmental Consequences, OECD Publishing.

Osterwalder, A. and Y. Pigneur (2005), Clarifying Business Models: Origins, Present, and Future of the Concept, *Communications of the Association for Information Systems*, 16.

Osterwalder, A. and Y. Pigneur (2010), *Business Model Generation: Handbook for Visionaries, Game Changers, and Challengers*, John Wiley & Sons.

Rasmussen, B. (2007), Business Models and the Theory of the Firm, *Pharmaceutical Industry Project Working Paper*, Centre for Strategic Economic Studies, Victoria University of Technology, 32.