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Organisations' Resources and External Shocks: Exploring Digital Innovation in Family Firms

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ABSTRACT

Few external shocks have had as severe an impact on organisations as COVID-19. To date, research on how management can respond to such a trigger event is lacking. Due to their economic relevance, family firms, which are typically resource-constrained and rely on idiosyncratic resource allocation behaviour, are of particular interest in this regard. Based on a multicase study of German family firms and building on longitudinal insights from 112 semistructured interviews, we develop a framework explaining how an external shock such as the COVID-19 pandemic can trigger a change in family firms' motives. Linking adapted motives of family firms (i.e. survival, utilisation, and opportunism) with their resource allocation behaviour during the crisis (in terms of resource preservation, resource recombination, and social boundary resource development), we reveal how digital innovation (digital process innovation, digital product innovation, and digital business model innovation) originates as a result of a process of entrepreneurial action.

KEYWORDS

External shocks; resource-based view; digital innovation; family firms

1. Introduction

Very few changes in the corporate environment have had such a fundamental impact on the economy in general and individual companies in particular as has the COVID-19 pandemic (Donthu and Gustafsson 2020; Foss 2020a; Sun et al. 2020; Zhu et al. 2020). The contact restrictions imposed in many countries to control the pandemic (Brammer, Branicki, and Linnenluecke 2020) have caused supply chains and markets in many industries to collapse (Kano and Oh 2020). As the pandemic has spread globally, it has caused severe disruption to many businesses, thus challenging previous assumptions regarding the management of such organisations (Foss 2020b). Declines in sales, the need to immediately create new ways of collaborating with employees, and the breakdown of business networks due to contact restrictions have brought about major risk for companies' resource bases (Barney 1991; Rouleau, Hällgren, and de Rond 2020; Verma and Gustafsson 2020). The abovementioned consequences put organisations 'under a stress test,' which has led to the conceptualisation of these trigger events as *external shocks* (Raz

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and Gloor 2007, p. 171). External shocks are particularly intense for family firms, which, due to their preference for self-financing (Chrisman et al. 2015) and inward focus (Kotlar et al. 2013), are resource constrained (De Massis et al. 2018) on the one hand but, on the other hand, create unique resources through the interaction between the family system and the business system (Chua, Chrisman, and Sharma 1999; Zahra, Hayton, and Salvato 2004). These idiosyncrasies relate to the cash resources (Sirmon and Hitt 2003), knowledge and expertise of the members of the owning family and nonfamily employees (Horton 1986), and their relationships with the network partners of a family firm (Arregle et al. 2007). While company resources have been at significant risk throughout the COVID-19 pandemic, this concern is particularly pronounced for family firms. The combination of ownership and management in these companies and the lack of diversification of family wealth (Boubaker, Nguyen, and Rouatbi 2016) make families particularly dependent on the outcome of such external shocks because should a company's resources be eliminated, the resources of the owning family will also face major risk (De Massis and Rondi 2020).

While previous research has revealed that external shocks can foster the creation of new ventures (Davidsson and Gordon 2016; Simón-Moya, Revuelto-Taboada, and Ribeiro-Soriano 2016), we know surprisingly little about resource allocation and entrepreneurial action in resource-constrained organisations, such as family firms, in their efforts to respond to external shocks such as the COVID-19 pandemic. Despite increasing research interest in the resources of family firms (Sirmon and Hitt 2003) and their idiosyncratic entrepreneurial actions (Kellermanns and Eddleston 2006) – for instance, their innovation behaviour (Duran et al. 2016; Hsu and Chang 2011; Magistretti et al. 2019) – extant research has not investigated the impact of external shocks on family firms' resource bases and entrepreneurial actions. This lack of attention is surprising because external shocks such as financial crises, natural disasters, terrorist attacks, and wars occur regularly on a global basis (Doern, Williams, and Vorley 2018; Landini, Arrighetti, and Lasagni 2020) and can have a devastating effect on organisations in general and family firms in particular (Conz, Lamb, and De Massis 2020). Given their wide distribution in most countries, the potential destruction of family firms could cause entire economies to collapse (De Massis and Rondi 2020). This raises the following research question: *How does an external shock affect family firms' resource allocation and thus their innovation behaviour?*

Answering these research questions is important and relevant for various reasons. First, an in-depth understanding of the impact of external shocks on family firms' motives would allow researchers to better understand the far-reaching consequences of such shocks for these types of companies. Second, a more nuanced understanding of the resource allocation behaviour in times of external shocks allows us to consider the (regularly occurring) effects of such shocks on the very core of companies. Third, explaining the consequences (i.e. the entrepreneurial actions and innovation behaviour triggered by the shocks and adapted resource base) will help us understand new forms of innovation processes and outcomes in these organisations. To address these research questions, we employed a longitudinal multicase study design to investigate four German family firms. Building on this qualitative approach, we collected rich data, including 112 interviews with executive managers, top decision-makers, and specialists, as well as further primary and secondary data. Our theoretical framework, which we developed

based on our findings, explains family firms' motives before and after an external shock (here, the COVID-19 pandemic), their adapted resource allocation behaviour in times of external shocks, and how different kinds of digital innovation emerge as an entrepreneurial action initiated to respond to the trigger event.

Given these findings, we aim to make at least the following three major contributions to the management literature in general and entrepreneurship research in particular: First, we reveal how external shocks affect the attention focus and motives of organisations in general and family firms in particular. With these insights, we challenge the prevalent assumptions that such motives are a continuous aspect (nearly) free from external influences (Croce, Grilli, and Murtinu 2019; Diaz-Moriana et al. 2020). Second, we provide a much more nuanced understanding of entrepreneurial action and the creation of (digital) innovation in resource-constrained organisations (König, Kammerlander, and Enders 2013; Soluk and Kammerlander 2021; Soluk et al., 2021). While previous studies have neglected entrepreneurial action and innovation behaviour in times of crises, we shed light on how external shocks can fundamentally alter firms' innovation behaviour, particularly regarding digital innovation (George, Lakhani, and Puranam 2020; Leonardi 2020). Third, by showing how resource allocation behaviour is adapted through shocks as an external trigger, we provide important insights into the understanding of resources in these organisations. In doing so, we provide in-depth knowledge on the dependence of firms on different kinds of resources during shocks and how exactly these resources are allocated in resource-constrained environments (De Massis et al. 2018).

2. Theoretical background

Organisations of all kinds have been and will inevitably continue to be exposed to external shocks (Colombo and Grilli 2017; Dachs et al. 2017; Landini, Arrighetti, and Lasagni 2020). Although previous research has made various attempts to conceptualise external shocks, they can be defined as 'a period of prolonged and widespread crisis in which actors struggle to reconstitute all aspects of social life' (Fligstein and McAdam 2011, p. 32; see also Raz and Gloor 2007; Tsouri & Pegoretti, 2021). Examples of external shocks include wars (e.g. World War II, the ongoing Russo-Ukrainian War), natural disasters (e.g. the 2005 Hurricane Katrina, the 2011 Tōhoku earthquake and tsunami in Japan), financial crises (e.g. the Great Depression in the 1930s, the 2007–2008 global financial crisis), terrorist attacks (e.g. the September 11 attacks in 2001, the November 2015 Paris attacks), pandemics (e.g. the 2009 H1N1 swine flu pandemic, the ongoing COVID-19 pandemic), or other incidents that can be both considered human-made versus acts of nature. Such external shocks can be key drivers of organisational transformation through causing the loss and reshuffling of resources (Corbo, Corrado, and Ferriani 2016). However, in previous research, external shocks have mostly been associated with threats to organisational functioning and performance (Williams et al. 2017). External shocks have the potential to devastate organisations and exhaust their resources (James, Wooten, and Dushek 2011). Core traits that characterise such contexts, such as rapidly declining sales or profits, job losses, and a declining competitive position, are further implications of external shocks (Mishra 1996). Often, external shocks affect not only individual organisations but also the wider network of stakeholders (e.g.

customers, suppliers, business partners) who are part of a firm's value creation as potential beneficiaries and risk bearers (Mitchell, Agle, and Wood 1997). The shareholders of a company, whose wealth is often tied up in one or a few businesses and whose private economic situation is therefore also dependent on the outcome of an external shock (Bragoli, Cortelezzi, and Marseguerra 2016), are particularly relevant in this regard.

A company's resource base is of particular relevance when responding to an external shock and attempting to ensure that company's continued existence beyond the disturbance (Landini, Arrighetti, and Lasagni 2020). To distinguish among different forms of resources, a lack of financial capital restricts decision-making options and can therefore lead to more layoffs following external shocks (Gittell et al. 2006), human capital can help to address the complexity of external shocks (Lengnick-Hall and Beck 2005; Lengnick-Hall, Beck, and Lengnick-Hall 2011), and social capital is a prerequisite for learning from business partners or implementing complementary approaches with them in a collaborative manner in order to engage in entrepreneurial action after external shocks (Tsouri 2019). Thus, access to a broader resource base can lead to a more effective response to external shocks (van der Vegt et al. 2015). Corporations with more financial slack (e.g. through debt capital on the capital market) – which determines access to financial, human, and social capital – will have more instruments at their disposal that they can mobilise to develop situation-specific responses, while resource-constrained companies will be at a disadvantage (Weick and Sutcliffe 2015). This is one of the reasons why resource-constrained firms have been shown to be more economically vulnerable to external shocks (Lai et al. 2016), which is also reflected in the higher failure rates of these firms in times of disturbance (Latham 2009). Therefore, for resource-constrained companies, the rapid reorganisation of available resources can play a critical role in overcoming the pressures that such organisations face and developing competitive solutions in the new reality that emerge during or after an external shock (Barton and Sutcliffe 2009; Williams et al. 2017).

A current and ongoing example of an external shock is the global COVID-19 pandemic (Huang et al. 2020; Li et al. 2020). The COVID-19 pandemic has many traits that are also associated with other external shocks that are not considered pandemics. These include the dramatic (negative) impact on affected businesses, such as the collapse of supply chains, which threatens the survival of many firms (Ivanov 2020; Pantano et al. 2020); high levels of unemployment (International Labour Organization 2021); and related negative effects on global trade (World Trade Organization 2020). However, during the COVID-19 pandemic, idiosyncrasies of this external shock that distinguish it from other trigger events have also emerged. These include the fact that, unlike natural disasters or wars, there is no destruction of the physical infrastructure of businesses (Williams and Shepherd 2016). In addition, due to the contact restrictions and industry-specific lockdowns that have been implemented during the COVID-19 pandemic, the impact on business is more dependent on sectoral association than on economic performance prior to the external shock (as observed in the 2007–2008 financial crisis; Smallbone et al. 2012). While service businesses, the tourism industry, and even the manufacturing industry have suffered significant damage, food retail and pharmaceutical trade have (at least partially) prospered during the pandemic (Boulos and Geraghty 2020; Higgins-Desbiolles 2020). Government-imposed social distancing measures have also

resulted in particularly intensive utilisation and further development of digital innovations during the COVID-19 pandemic (Donthu and Gustafsson 2020), such as digital health solutions (Panigutti, Perotti, and Pedreschi 2020), virtual collaboration (Waizenegger et al. 2020; see also Mattarelli and Tagliaventi 2010), and the use of artificial intelligence solutions to maintain supply chains (Modgil, Singh, and Hannibal 2021).

The impact of external shocks in general and the COVID-19 pandemic in particular are 'triggering particularly salient challenges for family businesses', which represent the backbone of economies worldwide (De Massis and Rondi 2020, p. 1). Family firms are defined as companies owned by one or a few families, resulting in a high level of family control, often a degree of family involvement in management, and values as well as corporate culture being strongly shaped by the owning family (Brinkerink et al. 2020; Chrisman and Patel 2012). Often, family firms will have existed for many decades and been passed on from one family generation to the following (Brigham et al. 2014; Lumpkin and Brigham 2011), resulting in a tight intertwining of the family system with the business system, meaning that the two dimensions are often strongly emotionally connected (Brinkerink et al. 2020; Shepherd and Haynie 2009; Sundaramurthy and Kreiner 2008). The emotional attachment between the family and the business results in a tendency to not involve outside investors in the company, as the owning family may not want to yield decision-making authority to nonfamily individuals or institutions (Chrisman and Patel 2012; Patel and Chrisman 2014). In turn, family firms tend to finance themselves through retaining earnings and avoid external capital providers, which often limits the financial slack in family firms (Gómez-Mejía et al. 2007). The goal is to maintain family control and strengthen the independence of a family firm with the aim of passing the company to the next generation in the future (Chrisman et al. 2012; Kotlar and De Massis 2013). This desire to run a family firm even without (family-) external shareholder pressure (Carney 2005) results in a situation in which the limited financial slack is also present in larger family firms as well; constraining such firms to make investments comparable to those made by corporations, which can finance themselves via the stock market, private equity, or other external financiers (Block et al. 2013). This tendency of family firms to self-financing is consistent with the behaviour of many other owner-controlled companies around the globe (Chrisman et al. 2015). For these reasons, family firms are described as resource constrained (De Massis et al. 2018). However, family ownership also induces the accumulation of unique resources over generations that are idiosyncratic to family firms (Zellweger, Nason, and Nordqvist 2011). Divergent perspectives within the owning family (Kotlar et al. 2020), knowledge and learning across generations (De Massis et al. 2016), and strong relationships with network partners further characterise family firms (Duran et al. 2016). However, the emotional bond between the family and the business, as well as the concentration of family wealth in the company, also leads to family firms having a particular high degree of vulnerability in times of external shocks (De Massis and Rondi 2020; Diaz-Moriana et al. 2020). The fear of loss relates to the family's own company, but the widespread presence of family firms in global economies and their embeddedness in international supply chains also poses default risks for the global economy as a whole (Miroshnychenko et al. 2021). Moreover, family firms face particular challenges in terms of their human capital due to succession processes and the regular withdrawal of

knowledge holders (Blanco-Mazagatos, de Quevedo-puente, and Delgado-García 2018). However, the early transfer of knowledge and resources from one generation to the next and considering the supportive role of long-term business partners can mitigate these challenges (Cabrera-Suárez, García-Almeida, and De Saá-Pérez 2018). To mitigate the risks associated with an external shock, the resource constraints of family firms require a reallocation of existing resources (Chrisman, Chua, and Steier 2011; Conz, Lamb, and De Massis 2020).

Although previous research has emphasised the importance of resource allocation and the idiosyncratic role of family-related goals and motives (Campopiano, De Massis, and Kotlar 2019), defining motives as motivational dispositions that are 'aimed at achieving desirable future outcomes and accomplishing the firms' [. . .] goals' (Diaz-Moriana et al. 2020, p. 11), it is surprising that we still know relatively little about the mechanisms underlying how external shocks affect family firms and how such organisations can reallocate their resources in order to adequately respond to a shock. While initial evidence suggests that firms' innovation behaviour is fundamentally reshaped by digital technologies (Soluk, Kammerlander, and De Massis 2021) and that family firms even outperform nonfamily firms in exploiting 'posttraumatic entrepreneurial opportunities' after an external shock such as an earthquake (Salvato et al. 2020, p. 2), existing research remains shy in explaining the underlying mechanisms. A more in-depth understanding of the paradoxical situation with regard to the higher vulnerability of resource-constraint firms to external shocks on the one hand (Lai et al. 2016) and the superior ability of family firms to exploit innovation opportunities following an external shock (Salvato et al. 2020) on the other could provide both innovation and management research with a more nuanced understanding of the behaviours of businesses in times characterised by significant uncertainty.

3. Methodology, data collection, and data analysis

This study investigates how an external shock can trigger changes in family firms' motives, how these adapted motives affect family firms' resource allocation behaviour, and how the resulting new resource base determines entrepreneurial actions and innovation in these organisations. Given the lack of knowledge regarding how and why organisations adapt and respond to external shocks, we have chosen an inductive, case-based approach (Yin 2013), which allows us to engage in theory building (Eisenhardt 1989). We laid the groundwork for this study by conducting a research project on technological innovation and organisational transformation prior to the outbreak of the COVID-19 pandemic. The emergence of the COVID-19 pandemic allowed us to include this phenomenon in our study and to observe the consequences of this external shock for our case firms. Thus, we combined the data acquired before the COVID-19 pandemic with data obtained after the outbreak and consolidated them in our research. In doing so, we build on the context of German family firms before and after the outbreak of the COVID-19 pandemic. This context is appropriate for gaining a profound understanding of the COVID-19 pandemic as an external shock for at least two reasons: First, the COVID-19 pandemic, with its far-reaching business implications – particular the shutting down of major parts of national economies – has triggered a severe economic and social crisis in Germany

(Donsimoni et al. 2020). Second, family firms are an important pillar of the German economy, as they contribute substantially to the country's economic performance (De Massis et al. 2018; Werner, Schröder, and Chlosta 2018). Due to the novelty of the topic and the fact that research on the impact of external shocks on organisations in general and on family firms in particular is still nascent and that this topic is poorly understood, a case-based exploratory research design investigating the 'how' and 'why' of this phenomenon is well suited to address these issues (Eisenhardt 1989). Longitudinal case-based methods are particularly well-suited to answering our research questions, with which we intend to examine the changes in strategic foci prior to and following the environmental changes caused by the COVID-19 pandemic, as such methods allow us to better explain the temporal effects inherent in such crises (Doern, Williams, and Vorley 2018). Within the multicase approach, we engage in within-case and cross-case pattern analysis to reveal the similarities and differences between the actions the case firms took in response to the shock and therefore contribute to theory building (De Massis and Kotlar 2014; Eisenhardt 1989; Yin 2013).

Our sample consists of four German family firms from the manufacturing industry; we focus on their adaption and innovation behaviour after the outbreak of the COVID-19 pandemic. Consistent with the aforementioned definition of a family firm, we relied on the following sampling criteria: First, one or a few families account for 100% of the ownership of the firm; second, the company has been led by the same family for at least three generations, which ensures that the sample consists of firms that reflect the typical characteristics of a family firm with a longstanding intergenerational heritage; third, at least one family member is active in executive management (including the supervisory and advisory boards); fourth, the firm must be located in Germany and operate in the manufacturing industry (to ensure sectoral comparability); fifth, the firm must be of a large size, so that the idiosyncrasies of small and medium-sized enterprises (SMEs), such as a lack of formalisation (Davis and Bendickson 2021), do not distort the observations; and, sixth, the firm must have implemented a relevant innovation process, which will serve as the foundation for observing entrepreneurial processes and outcomes within the organisation. In addition, it was a necessary condition that each company was generally willing to participate in the study and to provide appropriate interview partners throughout the entire study period. The iterative and stepwise procedure of selecting our case firms was guided by our intended contributions to theory and informed by articles from professional magazines, industry reports, and information from German chambers of commerce. In order to ensure that identified companies met all aforementioned sampling criteria and that a sufficient number of interview partners would be available, an initial dialogue was held with company representatives prior to the formal data collection. Here, we made an initial inquiry into the company's innovation activities and its potential contribution to theory building. We took this initial assessment into account when deciding whether the company was a fit for our theoretical sample or not. After we had analysed the first two cases, we decided to add family firms to the sample that complemented it by adding variance. This way, we were able to reveal insights that are more grounded in varied empirical evidence. Moreover, this approach promises more precisely represented

constructs and relationships, which can be clearly distinguished as idiosyncratic to an individual case firm or consistently replicable along the case sample (Eisenhardt and Graebner 2007). With this theoretical sampling, we ensured that additional data do not alter our findings and that alternative explanations are ruled out, thus leading to the emergence of a stable theory and the achievement of theoretical saturation (Corbin and Strauss 2008; Eisenhardt 1989). All case firms are privately owned and independent in their organisation, meaning that they are not part of a larger multinational enterprise. This requirement allows us to observe the decisions made before and after the external shock independently of other influencing factors or the regulations imposed by a larger group organisation. Table 1 presents anonymised background information on the four case firms.

To collect rich and informative data for our study, we built the data collection on different sources. First, we conducted semistructured interviews with executive managers and specialists from the four case firms. Second, we conducted expert interviews with top decision-makers and specialists from other organisations outside the case firms. Third, we conducted on-site observations at case firms' headquarters, trade partners' sites, and customers' locations. Fourth, we considered archival sources, such as web archives, annual reports, press articles, corporate documents and brochures, current websites, and analyst reports. Table 2 provides an overview of the different data sources used within the course of this study. With regard to the semistructured interviews and the collection of the additional data, we focused on four phases of field work, which together constitute the longitudinal character of the study. Prior to the outbreak of the COVID-19 pandemic (i.e. during phases 1 and 2 of data collection, which took place between March and July, 2017, and April and July, 2018, respectively), we particularly focused on questions such as the strategic management, attention focus, technology adoption, resource allocation, and innovation behaviour of the case firms. Following the COVID-19 outbreak (i.e. during phases 3 and 4 of the data collection, which lasted from March to September, 2020, and February and June, 2021, respectively), we expanded the semistructured guideline with questions regarding how the managerial focus and motives, resource allocation, and innovation behaviour of the firms were adapted to cope with this external shock. By including expert interviews, we follow the example of previous best practice multicase studies (e.g. Graebner 2009; Kammerlander, König, and Richards 2018; McDonald and Eisenhardt 2020) and respond to the call for scientific

Table 1. Description of case firms.

Case Firm	Employees	Industrial Sector	Ownership Structure	Foundation	Location
1 Bondone	15,000–19,999	Mechanical Engineering, Automation, Internet of Things	100% Family Share	1850–1874	Germany
2 Masaccio	20,000–24,999	Domestic Appliances and Commercial Equipment	100% Family Share	1875–1899	Germany
3 Raphael	10,000–14,999	Heating, Industrial, and Refrigeration Systems	100% Family Share	1900–1924	Germany
4 Titian	20,000–24,999	Industrial Control and Automation	100% Family Share	1925–1949	Germany

All names of companies and interviewees are anonymised throughout the paper, as confidentiality was guaranteed to all interview partners.

Table 2. Description of data sources and data collection phases.

	1st Phase of Data Collection (March-July 2017)			2nd Phase of Data Collection (April-July 2018)			3rd Phase of Data Collection (March-September 2020)			4th Phase of Data Collection (February-June 2021)		
Case Firm	Internal Interviews	Observations	Additional Data	Internal Interviews	Observations	Additional Data	Internal Interviews	Observations	Additional Data	Internal Interviews	Observations	Additional Data
1 Giotto	Director 1, HoX 1, Specialist 1	Industry fair, corporate headquarters, customer	Web archives, annual reports, press articles, press releases, corporate documents	Director 2, Director 3	Industry fair, corporate headquarters, trading partner	Web archives, annual report, brochures, press releases, corporate documents, customer reviews	Former CEO, Director 4, HoX 1	Virtual workshop, customer	Web archives, press releases, press articles, brochures, social media posts, corporate documents	Director 5, HoX 2, Specialist 2	Customer, virtual product presentation	Web archives, press articles, brochures, social media posts, corporate documents, videos
2 Masaccio	Director 1, HoX 1, HoX 2, Manager 1	Industry fair, corporate headquarters, branch office, trading partner, customer	Web archives, annual reports, archived interviews, press articles, press releases, customer magazines, customer reviews, internal reports	Director 2, HoX 3	Industry fair, branch office, trading partner, customer	Web archives, annual report, press articles, press releases, corporate documents, corporate documents	Director 1, Director 3, HoX 1	Corporate headquarters, trading partner, customer	Web archives, press releases, press articles, customer magazines, social media posts, customer reviews, corporate documents	Director 3, HoX 4, Specialist	Corporate headquarters, branch office, trading partner, customer	Web archives, press articles, press releases, social media posts, corporate documents, promotion spots

(*Continued*)

Table 2. (Continued).

	1st Phase of Data Collection (March-July 2017)			2nd Phase of Data Collection (April-July 2018)			3rd Phase of Data Collection (March-September 2020)			4th Phase of Data Collection (February-June 2021)		
Case Firm	Internal Interviews	Observations	Additional Data	Internal Interviews	Observations	Additional Data	Internal Interviews	Observations	Additional Data	Internal Interviews	Observations	Additional Data
3 Raphael	CEO, HoX 1, Project Manager 1	Corporate headquarters, trading partner, customer	Web archives, press releases, press articles, reports, corporate documents, brochures, customer reviews	HoX 2, Manager	Industry fair, trading partner, customer	Web archives, annual report, brochures, press articles, press releases, corporate documents, customer reviews	CEO, HoX 1, 2 x HoX 3	Trading partner, customer	Web archives, corporate documents, press releases, press articles, social media posts, customer reviews, brochures	HoX 3, Project Manager 2	Trading partner, customer, virtual product presentation	Web archives, press articles, press releases, social media posts, customer reviews, podcast
4 Titian	HoX, Manager, Project Manager 1, Specialist	Industry fair, corporate headquarters, trading partner	Web archives, press articles, press releases, brochures, reports, corporate documents	Project Manager 2	Industry fair, corporate headquarters, customer	Web archives, annual report, press articles, press releases, corporate documents	CTO, 2 x HoX, Manager	Branch office, trading partner	Web archives, annual report, archived interviews, press articles, press releases, social media posts, corporate documents	2 x HoX, Project Manager 2	Corporate headquarters, branch office	Web archives, press articles, press releases, social media posts, corporate documents
Case-Specific Data	14 Interviews	14 Observations	26 Add. Data	7 Interviews	13 Observations	24 Add. Data	14 Interviews	9 Observations	27 Add. Data	11 Interviews	11 Observations	23 Add. Data
Expert Interviews	19 Expert Interviews			14 Expert Interviews			18 Expert Interviews			15 Expert Interviews		
						Sum: 245						

CEO: chief executive officer; CTO: chief technology officer, HoX: head of department

rigour in terms of ensuring the validity of findings in qualitative research (Maxwell 1992). The expert interviews allowed us to include case-external and 'objective' views on the discussed questions in our research (Flick 2009). For instance, the insights from the expert interviews helped us to assess the novelty of innovations in the case firms. They also allowed us to differentiate which behaviours were idiosyncratic to family firms and which observed mechanisms were unique to an external shock (e.g. compared to the usual decision-making of the firms). The broad expertise of the industry experts, including suppliers, customers, advisors, academics, and analysts, ensured that these perspectives provided a relevant input to the assessment of the case evidence. Triangulating the insights provided by industry experts with the evidence from the case firms thus helped us to mitigate potential biases and generate valid insights. The expert interviews also provided a clearer understanding of industry norms and the overall context across the individual case firms. This applied, for instance, to a more in-depth understanding of the specific government interventions enacted in the wake of the COVID-19 pandemic.

In analysing our data, we first created an overview of the case firms' activities before and after the COVID-19 outbreak. In doing so, we ensured a triangulation of the different data, including interviews, observations, web archives, corporate documents, and other sources. With this approach, we aimed to verify as much information about the case firms as possible and thus compared the interview statements with the other data. This cross-checking procedure allowed us to mitigate any potential concerns regarding biased responses within the interviewees' statements. In coding our data, we first applied an open coding approach (Corbin and Strauss 2008), which means that we highlighted passages that were linked to case firms' attention motives, resource allocation, and innovation behaviour in line with our research questions. Second, we shifted our attention from within-case analysis to cross-case pattern analysis and compared the codings across cases following the axial coding technique (Corbin and Strauss 2008). Therefore, we developed coding categories relevant to our research questions and linked them accordingly, searching for similarities (e.g. similar motives, resources, or entrepreneurial actions) and differences (e.g. different allocation behaviours or foci on different forms of innovations) between the case firms. Following established approaches to longitudinal qualitative research (Goffin et al. 2019; Powell and Baker 2014, 2017), we performed this procedure for each phase of the field work. The first phases of our data analysis were characterised by the emergence of numerous potential concepts and themes as the number of interviews and other data sources increased. As we concluded the third and fourth phases of our field work, more general categories and themes emerged from our data, allowing us to translate previously attained insights into a temporal explanation of the companies' behavioural patterns. Building on this longitudinal approach, it was therefore possible to elucidate the behaviours of the companies before and after the external shock and to go into detail concerning the temporal patterns in the further course after the shock. These temporal patterns refer, for instance, to the question of how sustainable the changes in the companies triggered by the shock (e.g. in terms of resource allocation patterns) were and whether and when original conditions were reinstated. With this procedure, we aimed to address the 'lack of informed debate around longitudinality in innovation research' (Perks and Roberts 2013, p. 1102), which is

particularly relevant to the study of external shocks (Doern, Williams, and Vorley 2018). Building on this analysis, we developed the theoretical model of this study through an iterative process.

4. Findings

The following examinations provide an overview of the patterns we identified in the case firms in the context of the COVID-19 outbreak. We explain the pre-shock motives of these family firms and how the external shock altered their attention focus (post-shock motives). Moreover, we identify the resource allocation behaviours that occurred in the aftermath of the pandemic outbreak, including the consequences in terms of entrepreneurial action and innovation outcomes. Our findings are summarised in propositions and visualised in the theoretical model in Figure 1.

4.1. Pre-shock motives, External shock, and post-shock motives

The within-case and cross-case pattern analyses revealed that the companies exhibited three main motives prior to the COVID-19 pandemic. First, all four family firms exhibited a strong *long-term perspective*. In this context, we define long-term orientation as an emphasis on the long-term implications of firms' decisions. This focus is particularly evident in the fact that these companies' decision-making for projects – such as investments or strategic adjustments – paid considerable attention to the long-term effects on their own business, with less attention being paid to

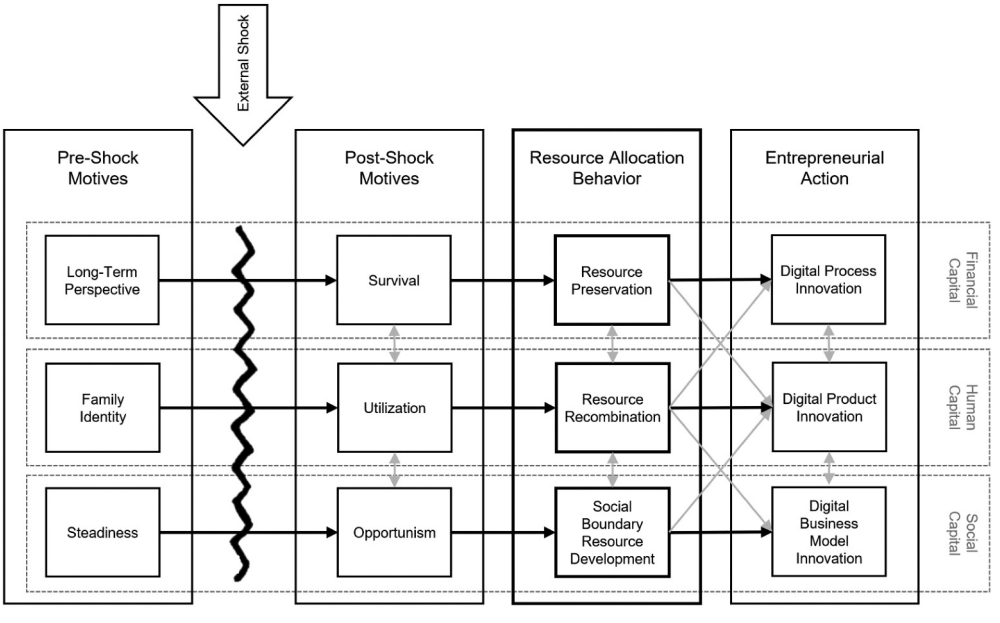

Figure 1. Theoretical framework of family firms' motives, resource allocation, and entrepreneurial action in response to an external shock.

short-term profits. Across the case firms, this long-term orientation was exemplified by top management and family owners. The primary interest of the case firms was in preserving family wealth and remaining independent from the excessive influence of external financiers (i.e. protecting the financial capital of their firms through their tendency towards self-financing). Case firm Raphael's chief executive officer (CEO) explained the reasoning behind this motive:

> "The family wants to preserve the company in the long run, particularly as a family business. It is a declared goal not to bring in investors; everything should run on its own. Usually, all essential decisions are subordinate to this long-term ambition."

Second, all case firms demonstrated a strong *family identity*, which had a significant impact on their business activities (e.g. deciding which markets to enter). Family identity is reflected in the fact that a company has an identity-forming characteristic for both owners and employees. The commitment of the owning family in terms of its contribution to the success of a company can be explained by the unique link between ownership and management influence in family firms. The case evidence reveals that the owning family's perception of its role in contributing to the economic success of a company is just as important as emotional factors such as the family's reputation vis-à-vis internal and external stakeholders. In this regard, a director from case firm Masaccio stated the following:

> "You can tell that the family is particularly keen to preserve the [public] perception of the company that has evolved over such a long period of time. [. . .] [The owning family] deals quite consciously and carefully with business relations in order to do justice to the reputation of the family and thus also to the company. The owners see themselves as having an obligation that cannot be compared with that of a manager in a DAX company. [. . .] This goes much deeper. [. . .] This creates a unique experience and identity that impacts how the owners see themselves and how we see ourselves as a whole company."

Employees also tend to be employed by such firms for long periods of time and feel as if they are part of an extended 'family.' According to the case firms, this sentiment, in turn, compensated for difficulties in recruiting personnel in the pre-COVID-19 period; thus, family identity contributes to the human capital of firms. The head of department from the case firm Masaccio stated the following in this regard:

> "The whole company feels like one big family. [. . .] The two owner families have been fully interwoven since the company was founded. The employees and the owner families are also all on the same side. As I said, the whole company is one big family with a common feeling, which is also strongly reflected in the [shared] corporate culture."

Third, all four case firms showed that *steadiness* is another major motive affecting their respective businesses. We define steadiness as the attitude of companies to act evenly, continuously, and thus reliably. This steadiness is derived from the case firms' desire for continuity and refers, in particular, to the company's external relationships with business partners (in the case firms, particularly suppliers, customers, and industry organisations). Trusted individuals from the organisations (which, in the case of these family firms, are often owners or longstanding nonfamily members) tend to cultivate these business relationships intensively, and, in some cases, these relationships have existed for decades.

The case firms describe social capital as being particularly important, robust, and trustworthy. The director of the case firm Giotto explained this importance of social capital in more detail:

> "Our company was founded in the second half of the 19th century and is still in the hands of the founder's family. It has also always been based and had its headquarters in this town. It is deeply rooted in the region. [. . .] There are decades of connections with numerous local suppliers. There are also other local service providers, with whom we have simply always been in touch. All this stands for tremendous continuity in a very positive sense. [. . .] There are many trusting relationships, and [many business-related issues are] discussed and clarified personally."

While the first and second phases of data collection confirmed the consistent presence of the aforementioned motives, the COVID-19 pandemic, as a fundamental external shock, has completely overturned this perception. Various interventions by the German federal and state governments have led to the closure of stores, cultural and gastronomic facilities, schools and daycare centres, and other institutions. The call to reduce social interactions to a minimum meant that all other businesses were also affected and, in some cases, suspended production. Border controls restricted the international trade of goods, which caused European and global supply chains to collapse and made it much more difficult for companies to procure components. The travel bans imposed in Germany and the European Union (EU) made business trips much more difficult. While there was no explicit ban on doing business in Germany with regard to the manufacturing industry, the government interventions at least significantly impaired business activity in this sector. Table 3 summarises the government interventions related to the four waves of the COVID-19 pandemic in Germany.

The external shock affected the motives of the case firms in a threefold way. First, the case evidence revealed how firms' long-term perspectives have rapidly shifted towards the urge for (short-term) *survival*. This shift drastically changed the focus of all case firms to short-term survival for different reasons. The pandemic caused parts of the supply chains and, above all, companies' sales to collapse within a few weeks, which, in turn, had a massive impact on financial capital in particular, as it was reduced to a minimum during the crisis. The collapsing liquidity of companies prompted them to devote all their efforts to ensuring their short-term survival. Other motives, such as long-term considerations, were clearly deprioritised. A department head from the case firm Titian explained this new focus as follows:

> "At [Titian], business has collapsed massively due to Corona. The willingness to purchase [on our customers' side] has turned very negative. Customers are postponing investments as long as doing so is possible. [. . .] We first had to deal with this more than difficult situation. There were days when nobody really knew how to go on. [. . .] Every effort was made to keep cash in the company [and thus ensure liquidity]."

This altered motive was also reflected in the case firm Giotto. The director of this firm described the significant shift in mindset from a long-term perspective to short-term action:

> "[. . .] you hear from stock market companies how only the quarterly figures are paid attention to. That didn't really exist before [in our company]; the focus was always on the long run. [. . .] [After the start of the Coronavirus crisis], that inevitably changed massively

Table 3. Course of the COVID-19 pandemic and government interventions in Germany (in chronological order up to February 2022).

Date	Measures/Interventions	Competence	Wave
27 January 2020	The coronavirus is identified for the first time in Germany	Bavarian Ministry of Health	First Wave
27 February 2020	To combat the Corona epidemic, a crisis team envisaged in the federal pandemic plan is established	Federal Ministry of the Interior and Federal Ministry of Health	
10 March 2020	The cancellation of all large public and private events with more than 1,000 expected participants is recommended	Federal Government of Germany	
11 March 2021	The global spread of Covid-19 is declared a 'pandemic'	World Health Organization (WHO)	
11 March 2021	The Federal government agrees on simplified regulations on short-time working allowances for all sectors	Federal Cabinet	
12 March 2020	Due to the rapid spread of the virus, Chancellor Merkel calls on the population to refrain from social contact wherever possible	Chancellor Angela Merkel	
13 March 2020	Several states order schools and daycare centres closed	State Governments	
15 March 2021	It is announced that Germany will control several borders due to the spread of the coronavirus, which will cause problems with the cross-border movement of goods	Federal Minister of the Interior Horst Seehofer	
16 March 2020	Agreement that many stores will be closed from the next Monday on (essential stores such as supermarkets and pharmacies remained open), church services and meetings in clubs were prohibited, and playgrounds were closed	Agreement between the Federal Government and the State Governments	
17 March 2020	A ban on non-EU citizens entering the EU/Germany is imposed, which restricts not only tourism but also business trips	EU Council and Chancellor Angela Merkel	
01 April 2020	The existing contact restrictions are extended	Agreement between the Federal Government and the State Governments	
03 May 2020	A 'gradual opening of everyday life' is announced	Chancellery Minister Helge Braun	
29 September 2020	As a response to the rising number of corona cases, restrictions in social life are again introduced	Agreement between the Federal Government and the State Governments	Second Wave
28 October 2020	Under a 'lockdown light', citizens are ordered to reduce social contacts to a minimum; most cultural, gastronomic, and service businesses are closed down	Agreement between the Federal Government and the State Governments	
13 December 2020	Agreement that the infection control measures are further tightened ('second lockdown'); this includes in particular closures of most stores and service businesses, schools and daycare centres are also closed	Agreement between the Federal Government and the State Governments	
26 December 2020	The first vaccinations against COVID-19 take place in Germany	Federal Government and the State Governments	
03 March 2021	Agreement to initiate gradual easing depending on stable incidence levels	Agreement between the Federal Government and the State Governments	
23 April 2021	Due to high corona numbers, stricter contact restrictions and lockdowns are enacted ('federal emergency brake')	Federal Government of Germany	Third Wave
30 June 2021	The restrictions imposed on social life ('federal emergency brake') expire	Federal Government of Germany	

(*Continued*)

Table 3. (Continued).

Date	Measures/Interventions	Competence	Wave
15 November 2021	The designated Federal Government (coalition negotiations are still ongoing at this time) has tightened its plans to combat the COVID-19 pandemic due to rapidly increasing incidence figures; among other measures, contact restrictions are again discussed	Designated Federal Government of Germany	Fourth Wave
17 December 2021	The new Federal Minister of Health states: 'I anticipate a massive fifth wave.'	Federal Minister of Health Karl Lauterbach	
14 January 2022	Federal Minister of Health Karl Lauterbach intends to use booster vaccinations and contact restrictions to combat the rising number of infections caused by the omicron variant, which is now predominant. Compulsory vaccination is the subject of controversial political debate.	Federal Minister of Health Karl Lauterbach	
08 February 2022	Federal Minister of Health Karl Lauterbach sees no reason to withdraw measures against the spread of the coronavirus.	Federal Minister of Health Karl Lauterbach	

> for us. There was a lot of fear because we didn't know how long [the COVID-19 pandemic] would last. And, at least to some extent, the production sites were shut down completely. [. . .] That's when people suddenly started paying attention: What do we have to do to get through the next few weeks unharmed?"

Second, the cross-case pattern analysis revealed how the external shock triggered the *utilisation* of family identity – a family identity that was already present within all case firms but that had not previously been specifically utilised to cope with critical business situations. This has changed in the context of the external shock: the focus was not on building or nurturing family identity but on leveraging the existing human capital from both the owner family and the rest of the workforce to persevere through the crisis. One of the ways in which this shift in priorities has been reflected is that companies have used the divergent skills of family members to address challenges associated with the external shock. In the case firm Masaccio, for instance, one family member with good relations with governmental institutions helped finalise the corporate hygiene concept, while a family member at Raphael with a strong information technology (IT) background was responsible for building up the firm's digital infrastructure, which had to be completely redesigned for remote working. In addition to this explicit commitment, however, the case evidence also revealed how the owning families, based on their long-standing nurtured identities, also mobilised and contributed a considerable body of tacit knowledge in the period following the external shock. A head of department from case firm Raphael made the following comment:

> "Shortly after the COVID outbreak, the owning family realised that full commitment was needed. [. . .] Everything was put on the line and mobilised. [. . .] Even family members who do not actually have an active role in the company were more visible and got involved in communication and sometimes with special tasks. [. . .] It felt like a mobilisation."

A director from case firm Masaccio stated the following:

> "[This] extraordinary effort basically had an ultimate motivation: [. . .] It was about everything that [the family's] ancestors had built up for more than a hundred years and that has already survived wars so far. [. . .] The company is everything for the family. So everything was at stake for the family during the crisis. It's not just a simple job that you may or may not lose. [. . .] It's about the entire legacy as a family."

In the case of nonfamily employees, this utilisation consisted, in particular, of assigning experts in short-term crisis situations to maintain the value chain and to create emotional bonds between the company and the entire workforce despite the pandemic and physical distance requirements, which motivated staff to perform even in complex conditions. A director from the case firm Giotto noted the following:

> "We quickly rallied together to solve all the problems caused by COVID-19. That was necessary because we were suddenly confronted with completely new challenges, which we did not face prior to COVID-19. [. . .] We formed a kind of task force with our experts in the company, who took care of specific challenges. [. . .] We brought in experts from the purchasing department to handle the supply bottlenecks that arose for some specific parts by using alternative procurement channels. As a result, we have managed to prevent production delays for as long as possible. [. . .] All employees really worked hard because they knew what was at stake for everyone in a crisis such as this."

Third, the case evidence indicates that the motive to sustain steadiness in business and (external) relationships as a family firm changed to patterns of *opportunism*. The external shock led companies to seize every opportunity that seemed to have the potential to mitigate the effects of the crisis on their business in the short term and thus allow them to come through the crisis more successfully. This particularly applied to firms' social capital. Thus, new relationships were established at various levels after the outbreak of the pandemic, mostly based on opportunistic motives. Case firms, for example, created new relationships with health authorities, IT service providers, startups, new suppliers, and new customers. Although these new relationships contradicted the pre-COVID-19 motives of longstanding and trusting external relationships, the firms saw them as essential for overcoming the crisis. The chief technology officer (CTO) from Titian noted the following in this regard:

> "We explored completely new terrain [. . .] We did not overlook any opportunity to develop our business during the crisis. In addition, while our regular markets collapsed, then, at least to a lesser extent, we explored new opportunities. [. . .] During the crisis, we positioned ourselves much more strongly in the healthcare sector, where we have developed joint initiatives with doctors, hospitals, and high-tech startups. Everyone is affected by the crisis, so it is at least possible to develop new approaches together and get them on the road."

In the case firm Raphael, we observed that the short decision-making paths and the fact that family members were highly involved in the management team made it possible for the motives to be altered quickly. Very soon after the outbreak of the COVID-19 pandemic in Germany, the company started to work on projects that would not have been considered part of its own portfolio previously. Raphael's project manager commented on this development as follows:

> "You kind of have to see how you can get along. If business doesn't develop in a linear fashion like it used to in the past, then you have to shift your thinking. That might have happened even without Corona, but Corona might even have strengthened this development. [. . .] We have landed orders that we had nothing to do with before. Several new subjects have popped up."

In addition, the case evidence revealed that the three post-shock motives also influenced each other, although to a lesser extent than the previously explained relationships. In particular, survival turned out to be a reinforcing factor for the emergence of the two motives of utilisation and opportunism. However, there was also an influence from utilisation to survival and opportunism, as the utilisation of the family identity was also being considered in the protection of financial capital and the use of social capital. Opportunistic motives were also found in considerations around human capital and financial capital after the external shock. Taking these aforementioned arguments together, we propose the following propositions:

Proposition 1a. *In family firms, the three motives of maintaining a long-term perspective, preserving a family identity, and ensuring steadiness in the organisations are particularly evident.*

Proposition 1b. *An external shock requires family firms to alter their motives from maintaining a long-term perspective to ensuring (short-term) survival, from preserving a family identity to prioritising the utilisation of the same, and from ensuring steadiness to promoting opportunism.*

4.2. Post-shock motives and resource allocation behaviour

While all case firms indicated that their post-shock motives were rooted in the external shock and were intended to contribute to overcoming it (i.e. the companies were subject to a constraint outside of the firms' area of influence), this adapted focus also had a far-reaching impact on the resource allocation behaviour within these companies. First, building on the adapted motive of survival, we conclude from our interviews that these family firms pursued a resource allocation behaviour that we describe as *resource preservation*. This resource allocation behaviour is a consequence of the urge to survive and resulted in the firms paying particular attention to protecting their financial capital following the external shock. Resource preservation is rooted in the cash outflow resulting from drastically reduced sales during the crisis. In practice, resource preservation is expressed by firms halting less prioritised and cost-intensive projects and, where possible, taking advantage of public subsidies (the case firms decided to apply for and received short-term work allowances from the Federal Employment Agency, special loans from the state-owned Development Loan Corporation, and potential deferrals of tax payments by the tax authorities). Regarding resource preservation, a department head from the case firm Giotto stated the following:

> "We went all out to keep the business running during the Coronavirus pandemic. At times, all employees in Germany were on short-term work, and there was a wage waiver for managers. We applied for state subsidies and bridging loans. [. . .] To ensure our ability to act in the short term, we did everything we could to secure the liquidity of the company. To this end, we mobilised every possible means."

The examination of the case firms over time revealed that resource preservation peaked immediately after the first policy interventions in Germany intended to contain the COVID-19 pandemic were implemented and in the three to four months thereafter. It

also showed that resource preservation measures were roughly aligned with the subsequent waves of the pandemic. The companies' measures also reached local highs in the winter of 2020/2021, when contact restrictions were again imposed by the federal and state governments. As 2021 progressed, the intensity of these resource allocation behaviours levelled off. A head of department of case firm Titian said the following

> "Over the course of time, we also drove somewhat on sight. Every time politicians intervened with laws or lockdowns, we could also notice appropriate preventive measures within our company. [. . .] Decisions were made very cautiously. [. . .] Since the [COVID-19] figures have been declining again very significantly since the spring of 2021, decisions have also somewhat returned to normal in terms of investments and so forth."

Second, building on the utilisation of divergent perspectives and tacit knowledge within the owning families as well as the rich experience of highly motivated nonfamily employees, the case firms demonstrated a resource allocation behaviour that we describe as *resource recombination*. This resource allocation behaviour arises from the necessity to use existing resources (particularly human capital) efficiently during the crisis and to recombine them to develop new approaches. The need to develop novel solutions to overcome the crisis prompted firms to increasingly shift their focus towards resource recombination, which is much more intense than their resource allocation behaviour before the external shock. The results were, in particular, complementary approaches, which resulted from the interdisciplinary competence of the staff (and in the cases of Masaccio and Raphael, also the owning families). For case firms, this degree of recombination of resources was novel. According to their information, however, this recombination was essential for them to be able to respond to the crisis. As Titian's CTO explained,

> "We also responded to the special requirements on site, as the spread of the disease was initially very different. Our country managers[1] played a key role here. They were assigned completely new tasks in the pandemic. We provided them with specialists from our headquarters who were familiar with health protection and prevention [. . .] but who also knew how to maintain supply chains. These joint efforts allowed us to address the course of the pandemic in the local decision-making process."

With regard to the progression of resource recombination over time, the case evidence revealed that, in contrast to engaging in resource preservation, at the point when the case firms were prompted to recombine resources by the new motive of utilisation, they further refined their ability to recombine resources and did not abandon this allocation behaviour. Thus, independent of the developments associated with the COVID-19 pandemic, it emerged that the ability to recombine resources was being extended to additional areas of each company. A director of case firm Giotto stated the following:

> "I think that the crisis has forced us to become more flexible. [. . .] It has been a very painful journey with a lot of unpleasant ambiguity. But we continue to draw on that agility."

Third, based on the adapted motive of opportunism, our case-based analysis revealed that family firms pursue a form of resource allocation behaviour that we refer to as *social boundary resource development*. This resource allocation behaviour is used, in particular, to reshape social capital and create the resources required to mitigate the effects of the

[1]The 'country managers' are the heads of a sales organisation abroad that is a (fully-owned) subsidiary of Titian.

external shock through developing new external relationships. With the emergence of new relationships during the crisis stimulated by opportunistic motives, new challenges also arose in the case firms. For instance, these firms were challenged to maintain control over their actions under these new circumstances, to protect intellectual property even in crisis-related stress situations, and to offer incentives to external business partners to participate in collaborations. Due to the very restrictive treatment of new forms of collaboration and the focus on longstanding (and mostly trust-based personal) networks prior to the crisis, the family firms were not prepared for these issues. The external shock forced them to address these concerns and build up the appropriate social boundary resources. The director of Masaccio described the challenge of building social boundary resources as follows:

> "We have entered into new partnerships to develop solutions that help us and society in the crisis. [. . .] While it would normally be a very long onboarding process to enter into formal collaborations, this process has become significantly quicker during the crisis. [. . .] The pressure to quickly find solutions that help us in the here and now has meant that we have become much more flexible in our decisions. Important conditions regarding legal issues, confidentiality agreements, technical standards, and IP protection were quickly clarified by our leadership."

The observation of the development of social boundary resources over time revealed that the long-term nature of these social boundary resources differed with regard to the external business partners involved. For instance, the case firms indicated a link between collaboration with public institutions and government agencies and the development of the COVID-19 pandemic: The higher the case numbers associated with the pandemic, the closer the interactions with the authorities. With regard to collaboration with private actors (e.g. suppliers, competitors, service providers, customers, and startups), there was an increasing trend over time, regardless of the further progress of the pandemic. The observations in the case firms suggest that the in-depth exchange with these partners also became part of daily business practice. A director from case firm Giotto made the following comment:

> "Now [in the summer of 2021], when the COVID-19 pandemic is not limiting our business at all and other problems are in the foreground again, we have already been able to use the higher openness [of our leadership] in collaboration with startups [and other external business partners] several times to support our development activities."

The observations in our case firms also showed, albeit to a lesser extent compared to above mentioned mechanisms, that the three resource allocation behaviours facilitated each other. Thus, resource preservation has helped to nurture resource recombination and the development of social boundary resources. Resource recombination has supported resource preservation and the development of social boundary resources, since the new configuration of human capital also provided impulses for these resource allocation behaviours. Similarly, the influence of social boundary resources on resource recombination and resource preservation diffused in the organisation through the associated social capital. Building on the aforementioned arguments, we formulate the following proposition:

Proposition 2. *After an external shock, the motive of survival requires family firms to adopt the allocation behaviour of resource preservation, the motive of utilisation induces resource recombination, and the motive of opportunism induces the development of social boundary resources.*

4.3. Entrepreneurial action and digital innovation

With the adapted resource allocation behaviour triggered by the shifted post-shock motives, the four case firms showed a distinctive tendency to turn these new resources into entrepreneurial action within their organisations. More precisely, partly due to external compulsion and partly due to their own discretion, decision-makers perceived the environmental change as a business opportunity to realise digital innovations. The social distancing imposed by the contact restrictions implemented by the federal or state governments led to an increasing virtualisation of collaboration in all case firms. This applied to not only internal collaboration (e.g. in internal processes) but also to value creation vis-à-vis customers and other external partners (e.g. in novel products and business models). This circumstance, which was rooted in the nature of the pandemic and its policy interventions, and the parallel technological advancement of existing and novel (digital) solutions drove the case firms to develop and introduce in particular *digital* innovation.

Our case evidence revealed how the different post-shock motives and the set of divergent resources developed following the outbreak of the pandemic helped foster the development and implementation of different digital innovations as an outcome of entrepreneurial action. First, building on the allocation behaviour of resource preservation, we observed in all four family firms a much greater ability to engage in *digital process innovation*. There were two main reasons for this observation: On the one hand, the contact restrictions imposed following the outbreak of the COVID-19 pandemic put great pressure on companies to push ahead with the digitalisation of their own infrastructure. This concerned, for instance, equipping the workforce with IT tools to enable home offices. Such developments led to the convergence of the family firms towards digital processes, where, due to organisational inertia, there was considerable resistance to the adoption of digital technologies prior to the external shock. In contrast, not only did the owner families change their mindsets regarding digital processes in general but they also realised that new digital process innovations could help them achieve the goals that arose from their short-term desire to survive. This is especially true because due to the environmental change caused by the pandemic, decision-makers engaged with digital process innovation and recognised that they could replace the costly analogue processes that had drained their companies' financial capital. The case firm Raphael's CEO, who is responsible for the company's IT infrastructure, stated the following in this regard:

> "We invested massively in our digital infrastructure. [. . .] We have automated processes so that they can be run as remotely as possible. [. . .] This initiative was an investment in difficult times. However, we were able to show how quickly these investments paid off. We had the chance to show how quickly we could save money and how much we could save through digital processes. [. . .] In this way, we were also able to make a financial contribution [to responding to the crisis]."

All case firms consistently expressed high confidence in the development and implementation of these digital process innovations and considered them to be a key factor in reducing operational costs and remaining competitive beyond the pandemic. The exceptions to this perspective were isolated examples in the case firms where, in the early phase of the pandemic, provisional digital processes were introduced that transpired to be incompatible with the other parts of the IT infrastructure. This resulted in a need for adjustments but did not affect the general orientation of the companies. Each case firm had undertaken initiatives for digital process innovation even before the outbreak of the COVID-19 pandemic. The within-case and cross-case pattern analyses revealed that these existing measures were accelerated by the external shock and that additional initiatives, such as the establishment of paperless home workplaces, were implemented in response to the pandemic.

Second, building on the resource allocation behaviour of resource recombination, all four case firms showed a greater ability to develop and implement *digital product innovation*. The recombination of resources was particularly evident for the members of the owning family and the nonfamily employees, thus involving the human capital of family firms. In light of the urge to compensate for declining sales during the crisis, the recombination of existing resources was particularly aimed at generating turnover for these companies, which was achieved despite the contact restrictions. Existing products and services were largely based on an analogue approach prior to this environmental change, and, in some cases, they included on-site exchanges that could not be carried out during the COVID-19 pandemic. By recombining resources, it was possible to create combinatorial innovation, especially with regard to companies' products and services. For example, in the case firm Titian, certain parts of the automation technology were equipped with digital sensors, thus allowing for the remote control of the components. The case firm Giotto developed digital after-sales services and introduced them to the market during the crisis. These newly developed digital product innovations should contribute to securing business activities beyond the crisis. A department head from the case firm Raphael provided an example of such an innovation:

> "We developed a ventilator during the pandemic. Although we had not been active in this field before, we did so because such devices were at times not available. The mobile ventilators have digital control and can be connected to other medical instruments. [. . .] Our developers from different teams have joined forces to develop the device."

As the pandemic progressed, digital products and services proved to be an important complement to the companies' more conventional portfolios. Products such as (digital) medical instruments, which were no longer the focus after an initial peak in the spring and summer of 2020 following the outbreak of the pandemic, were an exception. However, the opportunity to combine new digital products and services and thus offer integrated solutions for both existing and potentially new customers was an important learning effect for the case firms, one which was to continue during the further course of the pandemic. A project manager from case firm Raphael stated the following:

> "We have shown a lot of courage with our new digital solutions in the pandemic. [. . .] Not everything worked, but, in a very short period of time, we have overcome an extremely steep learning curve in terms of how we can materialise the Internet of Things for ourselves, even in our more traditional [customer] segments."

In contrast to the digital process innovations, where a considerable share of existing initiatives underlaid the novel actions taken by these firm, a large part of the digital product innovation were based on approaches that were completely new for the case firms.

Third, building on the social boundary resources developed by these family firms in the course of their opportunistic behaviour with regard to external relationships during the crisis, the case firms showed that due to this allocation behaviour, they are much better prepared to engage in *digital business model innovation*. The social boundary resources originating from the firms' opportunistic endeavours to build up new external partnerships to respond to the external shock and its consequences provided them with the basis on which to develop novel partnerships. Although the family firms were not open to such patterns prior to the external shock due to their risk aversion and rigid mental models, they are now able to engage with distributed networks, ecosystems, and platforms due to the social boundary resources they have developed. Through relying on their social boundary resources, the case firms are now able to resolve questions regarding intellectual property protection and their own control authority and to participate in open innovation formats with new cooperation partners. It is exactly this collaborative exchange that led these companies, together with their external partners, to create a new logic of value creation, which, due to its digital foundation, was able to persist in the virtual market created by the COVID-19 pandemic. The outcomes of these developments were digital business model innovations that are deeply rooted in the social capital of these firms. A department head from the case firm Titian provided the following statement as an example of such a digital business model innovation:

> "Based on its own digital platform, [Titian] developed a data hub that functions as an enabler for Internet of Things solutions. We use the platform to create fully fledged solutions. By billing data services on this platform, we have created a completely new logic for generating sales. [. . .] In developing and selling this platform, we have brought in strategic partners, including startups. [. . .] We are now planning to open up this platform to third parties, following the open and shared data trend. [. . .] This could be a customer's supplier or, for instance, a distributor."

In the case of digital business model innovation, we also observed that, over time, the case firms came to consider their new digital business models to be an important element of their long-term competitiveness. In this regard, the case firms emphasised the complementarity between digital business models and conventional business models in order to be able to cover both existing customers and new segments. Hence, the case firms were convinced that digital business models put them in a good competitive position to emerge from the COVID-19 pandemic. A head of department from case firm Raphael commented as follows:

> "Digital [business models] have opened up new markets for us. We will continue to work these markets in the future and be actively involved here. [. . .] With considerable effort, we have created something that will also last in the long term."

As with digital product innovation and in contrast to digital process innovation, the tendency towards digital business model innovation proved that the changes triggered by the external shock involved a high degree of novelty for the case firms in the sense that most of the initiatives were genuinely novel (as opposed to existing initiatives that had been accelerated by the pandemic).

Our case evidence also revealed – albeit to a much lesser extent than the aforementioned interdependencies – that resource preservation also nurtured digital product innovation, resource recombination has helped foster both digital process and digital business model innovation, and social boundary resources have assisted firms in developing digital product innovation, especially when external expertise is involved. Moreover, these digital innovations were mutually beneficial, with success stories describing the introduction of one digital innovation as facilitating the development of others – in particular, this occurred between digital process and product innovation and digital product and business model innovation (and vice versa). Summarising the previously mentioned insights, we propose the following proposition:

Proposition 3. *After the resource preservation prompted by an external shock induces the development of digital process innovation in family firms, resource recombination induces digital product innovation, and social boundary resources induce digital business model innovation.*

5. Discussion

Our findings show that trigger events such as the external shock induced by the COVID-19 pandemic require family firms to change their attention foci in regard to their financial, human, and social capital. Their post-shock motives (survival, utilisation, and opportunism) induced changes in their resource allocation behaviour (resource preservation, resource recombination, and social boundary resources). This adapted resource allocation behaviour in turn nurtured the development of digital process innovation, digital product innovation, and digital business model innovation. Based on these insights, we provide several important theoretical contributions.

First, these findings contribute to a better understanding of how organisations in general and family firms in particular react to external shocks (Campopiano, De Massis, and Kotlar 2019; Corbo, Corrado, and Ferriani 2016; James, Wooten, and Dushek 2011; Raz and Gloor 2007). While we confirm the findings of previous research on the role of long-term perspectives (Lumpkin and Brigham 2011; Lumpkin, Brigham, and Moss 2010), family identity (Bennedsen and Foss 2015; De Massis et al. 2016), and steadiness (Chrisman et al. 2015; De Massis et al. 2014) in family firms, we challenge the prevalent view that these motives are constant and independent of environmental influences. The explanation of how family firms shift their focus to short-term survival considerably extends the incomplete view of family firms' strategic orientation and motives (Croce, Grilli, and Murtinu 2019; Diaz-Moriana et al. 2020; Lumpkin, Brigham, and Moss 2010) and our understanding of how resource constraints can alter these foci (De Massis et al. 2018; Soluk, Kammerlander, and De Massis 2021). Reflecting on previous research on the concept of organisational identity (Brinkerink et al. 2020, p. 1), we introduce external shocks as another source of heterogeneity in terms of how organisations, and in particular family firms, deal with their identities in order to respond to major challenges. By shedding light on the utilisation of human capital in family firms, we show how family members and nonfamily employees can invest additional efforts during crisis situations due to their strong identification with their respective companies. In this way, we reveal how family identity can be considered as an antecedent of resource recombination patterns in firms under certain conditions, for instance, after an external shock

(Hauswald et al. 2016; Zellweger, Eddleston, and Kellermanns 2010). This integration of our understanding on (family) identity and the resource-based view considerably extends both ongoing debates and provides novel insights into the idiosyncratic resource allocation behaviour of family firms (Eddleston, Kellermanns, and Sarathy 2008; Kellermanns 2005). By revealing the mechanisms that lead to opportunistic behaviour in family firms and breaking with the paradigm of remaining with long-established business partners, we challenge extant beliefs regarding family firms' social capital (Arregle et al. 2007; see also: Chesbrough 2020; Crick and Crick 2020). With aforementioned insights, our contributions also go far beyond the family firm domain, as organisations with dominant shareholder coalitions or an emotional attachment between ownership and management might also be affected by these mechanisms (König, Kammerlander, and Enders 2013).

Second, we contribute to the ongoing scholarly debate on entrepreneurial action and (digital) innovation in resource-constrained organisations (Duran et al. 2016; Hsu and Chang 2011; Magistretti et al. 2019; Soluk and Kammerlander 2021). While we confirm previous studies that found resource constraints, organisations' inward-oriented focus, and rigid mental models to be the major obstacles to generating technological innovation in firms under conventional environmental conditions (De Massis et al. 2018; Kotlar et al. 2013), we challenge these previous assumptions by explaining how external shocks such as the COVID-19 pandemic can help resource-constrained organisations overcome these internal barriers. In doing so, we considerably extend the current pessimistic view on technological innovation in resource-constrained organisations in general and in family firms in specific (König, Kammerlander, and Enders 2013) and provide a much more nuanced picture of digital innovation in those businesses (Soluk et al., 2021), thus providing a deeper understanding of the impact of external conditions, particularly external shocks. While previous studies have generally focused on the 'dark side' of external shocks (e.g. Kuckertz et al. 2020; Lai et al. 2016), we reveal how crises can serve as a trigger event for profound organisational, entrepreneurial, and technological renewal in resource-constrained organisations (George, Lakhani, and Puranam 2020; Leonardi 2020). More surprisingly, we thus reveal how an existential threat such as the COVID-19 pandemic can contribute to firms' long-term competitive advantage.

Third, our study's findings contribute to a better understanding of how organisations adapt their resource allocation behaviour in response to external shocks (Landini, Arrighetti, and Lasagni 2020). While resource-based studies have thus far particularly focused on internal interdependences (Sirmon and Hitt 2003; Smallbone et al. 2012; Williams and Shepherd 2016), we reveal how resources change based on external triggers, thus extending the limited understanding of organisations in resource-constrained environments (De Massis et al. 2018; Raz and Gloor 2007). In particular, we emphasise the role of specific resource allocation patterns (resource preservation, resource recombination, and social boundary resource development) in organisations' endeavours to engage in entrepreneurial action. With these insights, we considerably extend previous research on the allocation of resources in resource-constraint organisations such as family firms, which has thus far provided a very narrow perspective on generic resource allocation behaviours or lacked a link to entrepreneurial actions in firms (Eddleston, Kellermanns, and Sarathy 2008; Sirmon and Hitt 2003). In addition, we contribute to a much more nuanced understanding of the role of financial, human, and social capital in organisations in times of crisis (Arregle et al. 2007; Horton 1986; Sirmon and Hitt 2003).

Specifically, we considerably extend previous research by explaining how organisations transfigure these resources over time when confronted with an external shock (De Massis and Rondi 2020). With regard to the impact of the COVID-19 pandemic, our study also contributes to an understanding where the pandemic is comparable to other types of external shocks (e.g. with regard to the collapse of supply chains and rapidly eroding sales; Ivanov 2020; Pantano et al. 2020) and where it differs from them. With regard to the destruction of physical infrastructure and capital that occurs with other external shocks, such as wars or natural disasters, but cannot be observed in association with the pandemic, we see an additional need for theorising with regard to the resource allocation patterns of organisations (Salvato et al. 2020; Williams and Shepherd 2016).

Finally, our study offers important implications for management practice. Managers and owners of and advisors to organisations in general and family firms in particular that seek to remain competitive during the COVID-19 pandemic and beyond should recognise the underlying mechanisms involved in adapting to external shocks. Our study provides management practice with important insights into the implications that external shocks have for firms, how these adaptations affect strategic foci and motives, and what role resources and resource allocation behaviours play in this regard (De Groote et al., 2022). With these insights, practitioners will be able to not only passively react to external shocks with short-term measures but also proactively shape the impact of an external shock through entrepreneurial action, thus helping to strengthen firms' competitive advantage through digital innovation.

6. Limitations and future research

Due to the qualitative, exploratory nature of this research, our study is subject to several limitations, each of which represents a promising avenue for future research. First, given that they are based on a qualitative multicase study, our insights are more suited to analytical rather than statistical generalisation (Yin 2013). Thus, to increase their generalisability, we would encourage future scholarly work to scrutinise our findings based on quantitative measures and statistical considerations. Although we ensured that we followed best practice approaches regarding the theoretical sampling in our study and also followed established suggestions on the optimum number of case firms (Eisenhardt 1989), a generalisation of our findings based on quantitative methods could allow us to expand the perspective to include an even wider range of firms (including those with different ownership structures; alternatively, it could also be possible to compare family and nonfamily firms), industries, and (geographical or cultural) contexts (Soluk, Kammerlander, and Darwin 2021). While we responded to the call to acknowledge the time-varying effects of crises through case-based longitudinal work (Doern, Williams, and Vorley 2018), we encourage possible future quantitative work to do the same and consider the effects over different time periods. Moreover, during the period in which we collected our data, the COVID-19 pandemic and its destructive effects on companies and economies worldwide were still ubiquitous and ongoing. For this reason, we consider investigating organisations in general and family firms in particular in the aftermath of the crisis (i.e. after the COVID-19 pandemic has abated) and determining how their motives, resource allocation behaviour, and entrepreneurial actions will develop thereafter as representing promising avenues for future research. In addition, future research

could place particular emphasis on comparing between family and nonfamily firms and, in doing so, more clearly highlight the differences between these (and possibly also other) kinds of organisations. Both qualitative and quantitative studies that include family and nonfamily firms in their empirical samples could provide an insightful basis for this more explicit comparison.

7. Conclusions

Our study reveals how external shocks such as the COVID-19 pandemic trigger changes in family firms' motives (in terms of survival, utilisation, and opportunism). Based on distinctive resource allocation behaviours (resource preservation, resource recombination, and the development of social boundary resources), family firms adapt their resource bases to cope with crises, which in turn affects their financial, human, and social capital. Building on these adapted resource bases and by engaging in entrepreneurial actions, family firms are able to generate digital process innovation, digital product innovation, and digital business model innovation. With these insights, we challenge previous assumptions concerning family firm innovation and provide a more nuanced understanding of how such firms respond to external shocks. These findings provide important theoretical and practical insights for the family business domain and beyond and open up promising paths for future research.

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