How to enhance company engagement in public-private emergency collaborations in the supply of essential goods

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Abstract

Purpose – In crises like natural disasters and the COVID-19 pandemic, public actors might have to take over responsibility for the population's supply when the market fails to meet the demand for essential goods. Companies can be valuable collaboration partners for public actors. However, conditions under which companies are willing and able to support public crisis management need to be better understood. This paper aims to empirically investigate expectations and motivation to better understand the motives leading companies to participate in public–private emergency collaborations. To enable successful collaboration, the paper develops crisis preparedness guidelines for state institutions and companies.

Design/methodology/approach – The authors develop and conduct a survey and statistically analyze the responses of 398 German companies from the food, health-care and logistics sectors.

Findings – Most companies have already engaged in crisis management and are willing to engage collaboratively. While their preferred contribution to collaborative crisis management is providing resources (e.g. goods or equipment) instead of coordination tasks, they also want to ensure that their business processes are sustained. Among the most promising incentives to increase company engagement are monetary compensation for provided resources and an improved communication policy. Logistics companies are motivated more by relaxing regulations, whereas health-care companies prefer reputation measures.

Practical implications – The insights provide the basis for public and private actors to foster public–private collaboration and raises awareness of its potential during crises. Moreover, this study promotes the systematic implementation of public–private emergency collaborations.

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Originality/value – To the best of the authors' knowledge, this study is the first to empirically investigate the perspective of companies operating in the fields of logistics, food and health-care industries toward public–private collaboration in crisis management.

Keywords Supply chain collaboration, Crisis management, Supply chain management in disaster relief, Emergency logistics, Public–private partnerships

Paper type Research paper

Introduction

Sudden-onset disasters like floods or hurricanes, or long-term, ongoing events such as climate change or the COVID-19 pandemic, confront supply chains with serious challenges. They can disrupt demand or supply in abrupt and persistent ways and go far beyond what companies are typically prepared for (Sodhi and Tang, 2021; Ye *et al.*, 2020; Hecht *et al.*, 2019). When disruptions in supply chains threaten to endanger the basic supply of essential goods, like food or pharmaceuticals, it is the responsibility of the government and related public actors to manage the crisis. In public perception, crisis preparedness at the national level is increasingly linked to state regulation of supply chains. Yet, regulations are just one of many policy options in crisis management.

In fact, companies can be valuable collaboration partners (Sodhi and Tang, 2021; Jahre *et al.*, 2016; Kaneberg, 2018), as they control large amounts of products needed for basic supply and operate in established communication structures. However, public actors do not and cannot have knowledge of complex supply chains' operations and challenges, making the need for collaboration between public actors and companies in crises affecting supply chains of essential goods more apparent.

One would expect collaborations between public actors and companies to be common in (public) crisis management, because examples of voluntary engagement in relief operations prove companies' fundamental willingness to collaborate (Fontainha *et al.*, 2016; Binder and Witte, 2007). However, some companies prefer to handle crises independently, like Walmart during Hurricane Katrina. Despite emphasizing the importance of stronger relationships with public actors and conducting joint emergency training, Walmart rejected contracts to become an emergency supplier, as large stockpiles did not fit its business model. Faster local decision-making and demand for better public support in preparedness were also factors (Horwitz, 2009).

Few long-term collaborations between public actors and companies in crisis management exist (Diehlmann *et al.*, 2021). This is often because such participation is typically not within a company's duty or business model. In addition, power differences and public actors' legislative authority can impact company operations (Diehlmann *et al.*, 2021; Fontainha *et al.*, 2016).

We use the concept of public–private emergency collaboration (PPEC), as defined by Wiens *et al.* (2018) and Diehlmann *et al.* (2021), which involves coordinated crisis management between public and private actors. PPEC focuses on managing resources, sharing information and competencies and designing legislation for effective essential goods supply. This collaboration should be long-term and planned, allowing public actors to reliably include company contributions in crisis management (Wiens *et al.*, 2018).

Our motivation to research PPEC incentives and barriers came from first-hand experiences in national research projects on crisis management of supply chains. Collaboration between public actors and companies seemed logical but was not practiced. Workshops and interviews provided insights into this gap: Consulting a food producer, logistics provider, food retailer and German public actors responsible for emergency food supply and transportation infrastructure revealed that public actors wanted data exchange, whereas companies sought regulatory information and contacts during the COVID-19 pandemic.

During projects that took place several years before the pandemic, interest in collaboration was lower, but workshop and interview sentiments were similar. Public actors welcomed any input and especially data from companies but were unsure how to encourage deeper collaboration beyond providing annual statistics. In other cases, they expected companies to initiate collaboration. Companies, on the other hand, were willing to provide short-term help during crises but were hesitant about long-term collaborations, seeing it as the public sector's responsibility to coordinate actions and design collaboration. Their claim was that such collaborations needed rules, compensation and oversight.

Hence, voluntary involvement of companies in long-term collaborations can be supported by identifying the required conditions and incentives (Tomasini and van Wassenhove, 2009; Müller *et al.*, 2022). Representatives in a workshop mentioned clarification of critical infrastructure affiliation during the COVID-19 pandemic as one incentive. Companies saw collaboration with public actors as a way to access crucial information quickly, leading to better planning. Being part of critical infrastructure offers advantages like regulation exceptions: A logistics provider and a beverage producer expected to benefit from better transparency of crisis measures and legal restrictions, enabling more efficient implementation.

Data privacy concerns are a major barrier to company collaboration, mentioned frequently by practitioners. Companies feared increased costs, resource surrender and added planning effort. However, they were willing to collaborate under conditions such as compensation and consideration of internal processes.

Public actors expressed skepticism about the reliability of company contributions but admitted lacking knowledge on how to incentivize and engage companies effectively. They showed interest in gaining general insights on this issue. We conjecture that the lack of PPEC at least partly results from a gap in the understanding of what motivates companies to participate in PPEC and of what keeps them from doing so.

PPEC involves civil protection and other typically separate responsibilities, making it a sensitive and ethically challenging issue. This may explain the scarcity of research and the rarity of established PPECs. To harness PPEC potential, we need to understand requirements for successful collaboration, including motivation and limitations. However, existing research lacks systematic empirical studies on drivers for company engagement in PPECs. Therefore, we aim to address these research questions: What are incentives and barriers to collaboration from a company's perspective? What can be done to enable and promote more PPECs? Which are efficient contributions of companies in PPECs?

We investigate these questions using a survey of 398 responses from German producers, logistics service providers and retailers of

essential goods. The survey, based on qualitative interviews and workshops with representatives of both public actors and companies, covered areas of company involvement, areas in which companies are able to support and the areas in which companies expect public actors to need support.

This study contributes to existing literature in three ways, which are further elaborated on in the "Discussion and Conclusion" section: First, it empirically identifies requirements and conditions for companies to engage in long-term collaboration with public actors. Companies are generally willing to participate in PPEC, but assign high priority to maintaining their business processes. In addition, they seek clarification and commitment from public actors for collaborative crisis management and prefer providing physical or informational resources, expecting monetary compensation and improved communication. Second, these insights help design PPECs aligned with companies' incentives. Third, our study raises awareness of PPEC's potential and promotes systematic implementation over spontaneous public–private interworking.

Literature review

Public crisis management

Especially in unexpected large crises, proactive preparations for different crises become more important. For example, public actors can set up communication structures, share crisis information and physical resources like stocks of goods or transport equipment to ensure the population's supply with essential goods or apply legal resources to adapt laws when necessary (Kovács and Spens, 2007; Diehlmann *et al.*, 2021).

An additional direct approach of public intervention in existing commercial supply chains during or before a crisis can occur through financial support (Hofmann *et al.*, 2023), formulation of sector-wide regulations or policies (Sodhi and Tang, 2021) and political initiatives (Chopra *et al.*, 2021). If the legal situation allows, even confiscation of critical private resources is possible (Wendelbo *et al.*, 2016).

However, in contrast to companies, public actors hardly possess sufficient production and logistics capacities as well as the technological know-how to supply the population with essential goods (Sodhi *et al.*, 2021; Diehlmann *et al.*, 2021). Therefore, they rely on companies and would thus primarily coordinate and support them to maintain commercial supply chains Li *et al.*, 2022). Such support can happen, for example, on an economy-wide level or, more specifically, on a company level. For more specific support, public actors require more detailed insights into complex and dynamic commercial supply chains, which they would often lack.

Supply chain risk management and business continuity management

During a crisis, a company's first motivation is to protect, maintain or recover business processes, which is at the center of business continuity management (BCM) (Craighead *et al.*, 2007). However, protecting staff and customers also arises from corporate social responsibility (CSR).

Due to this study's focus on supplying essential goods to the population, we focus on supply chain risk management and BCM. Supply chain risk management (SCRM) is defined by Tang (2006) as "the management of supply chain risks through coordination or collaboration among the supply chain partners to ensure profitability and continuity." We use the term "company crisis management" covering supply chain–related BCM and CSR in the following.

In response to more and more large-scale crises recently, Sodhi and Tang (2021) introduced the term "extreme supply chain management" (ESCM) for supply chain management for severe crises, which goes beyond supply chain risk management. It is applied in severe demand or supply increases or drops.

In noncrisis and crisis times, companies in commercial supply chains can produce the necessary physical resources to produce and distribute essential goods (e.g. raw material, production sites, trucks, warehouses) and rely on established communication structures with other supply chain members. Companies use advanced technologies to monitor demand and use track-and-trace systems and industry standards for information flow (Bealt *et al.*, 2016).

However, the companies' scope of action in a crisis outside established supply chains is limited compared to public actors. Setting up new business processes takes time and collaboration with competitors may be forbidden by competition law. Despite concepts of SCRM and ESCM being known, companies typically lack preparedness for disruptions or events of high impact and low probability (Scala and Lindsay, 2021). Recent crises have led to a stronger focus on SCRM among companies though (R. Elliott *et al.*, 2021). However, larger companies can be better prepared than smaller ones, which can lack formal emergency plans due to lack of time or expertise (Hecht *et al.*, 2019).

We conclude that the roles and strengths of public and private actors complement each other in terms of resources, coordination opportunities and preparedness. For a more detailed characterization of companies' and public actors' resources and planning strategies, we refer to Diehlmann *et al.* (2021).

Public–private emergency collaboration

Companies can increase their resilience through collaboration with other companies, including their competitors, and thereby improve supply chain resilience. Many possible collaboration measures are known, such as resource-sharing, collaborative communication, goal congruence, decision synchronization, incentive alignment and joint knowledge creation (Sodhi and Tang, 2019). Collaborative relationships in crisis management are increasingly encountered between companies and nongovernmental organizations (NGOs) (Falagara Sigala and Wakolbinger, 2019; Bealt *et al.*, 2016). Madsen and Rodgers (2015) found that companies collaborating with an NGO in their crisis-related CSR activities would receive more stakeholder attention than others.

Formal collaborative relationships between companies and the public sector, defined by Wiens *et al.* (2018) as a PPEC, are, however, rarely observed (Diehlmann *et al.*, 2021). PPEC combines commercial supply chains for essential goods with public relief supply chain management and includes joint planning, knowledge management and the use of resources. It is "designed for improved crisis management by joint coordination and collaboration between private and public representatives. A PPEC additionally requires thorough and joint preparation of both parties" (Diehlmann *et al.*, 2021), which distinguishes it from spontaneous collaboration.

Some research exists about public–private collaboration supporting the current relevance of PPECs. For example,

Sodhi and Tang (2021) suggested several research streams on crisis management with public actor involvement in commercial supply chains: public actor subsidy and support schemes, joint coordination of an exit from a lockdown and programs about reshoring production of essential goods. Based on the COVID-19 pandemic, Scala and Lindsay (2021) argued that supply chains should be seen as critical infrastructure and be managed collaboratively by government and companies. Moura *et al.* (2020) proposed further research on public–private collaboration and the type of resources shared, as well as how much know-how from both parties could be used to improve response to emergencies.

Furthermore, little is known about companies' motivation to engage in these collaborations nor the collaborations' success and potential benefits from a company perspective (Nurmala *et al.*, 2017). Existing research provides some suggestions for designing PPECs and assumptions about companies' motivation. Stewart *et al.* (2009) suggested that companies become involved in disaster response mainly for two reasons: first, to fulfill a public actor contract and second, to protect their assets, customers, suppliers or other interests in the disaster area. Breitbarth *et al.* (2021) proposed a PPEC for coordination of vehicles across logistics service providers for last-mile delivery during pandemics. The authors name intrinsic motivation and compensation as incentives for companies. Further, companies could benefit from improving resilience by getting up-to-date crisis information about demand or supply through established communication channels (Wiens *et al.*, 2018; Mehrotra and Schmidt, 2021).

However, barriers for companies might be similar to those to collaborating with humanitarian organizations. Often public actors are skeptical of companies and their willingness to provide help (van Wassenhove, 2006). Steyer and Gilbert (2013) claimed that companies would rarely take over the responsibility to prevent society's risks: Large companies would be more proactive, but large multinationals would be "insensitive to local concerns" and often lack legitimacy.

There is, to the best of our knowledge, no comprehensive empirical research about benefits and risks that companies see in engaging in a PPEC as well as the incentives required to make a PPEC attractive to companies. Because the issue has been recently raised more and more in literature, a deeper understanding of the companies' perspective, also about different industries and company sizes, is needed.

Research questions and hypotheses

Research questions

Research and practice need to understand better why and under which conditions companies would want to collaborate with government agencies to support crisis management. With improved knowledge, public actors can better motivate companies to join a PPEC and design stable PPECs, in which companies find incentives to act as reliable partners. To this end, we set up three main research questions (RQ). The first RQ is derived from the identified research gap in Section *Literature review* and was raised by public actors in workshops on several occasions:

RQ1. What are incentives and barriers for companies to collaborate with public actors?

RQ 1 refers to a company's entire business model and considers all areas in which companies can assist: provision of goods, logistics services, storage capacities, personnel, coordination and information exchange. For example, a potential barrier to a company to support in a crisis is that companies' business models need to be protected or stabilized. This was well illustrated during the COVID-19 pandemic, where extreme demand and supply volatility overwhelmed most preemptive measures enacted by companies to mitigate supply chain disruptions (Dohmen *et al.*, 2023). In such a situation, setting up a spontaneous collaboration is more time-intensive and less effective than using an existing collaboration framework where players know their roles:

RQ2. What can be done to enable and promote more PPECs?

In *RQ2*, we focus on options of public actors to make a PPEC attractive to companies. Public actors have a number of measures at their disposal to facilitate companies' participation in a PPEC: e.g. regulatory relief, financial compensation or an official testimony of a company's engagement. We want to find out how companies weigh financial reimbursements and positive public recognition and, if at all, in which phase of a crisis they would prefer to collaborate:

RQ3. Which are efficient contributions of companies in PPECs?

RQ3 deals with companies' contributions to PPECs. Assuming that companies are willing to participate in a PPEC: In what role and function do they believe they can make the most meaningful contribution? We differentiate three ways companies could contribute during a crisis: by providing goods, transportation resources or participating in joint planning.

We investigate the companies' perception of how companies can best complement public crisis management and the other way around. From the company's point of view, it is essential to know how a PPEC is designed and which tasks and responsibilities need to be fulfilled. Within the public debate, many practitioners are unsure about what preparedness means and associate it with regulation. This underlines the relevance of *RQ3*. Within *RQ3*, we also want to identify the strengths of different companies: Which type of company (e.g. concerning a specific sector) sees itself as particularly well suited for participation in a PPEC? This knowledge helps public actors to identify more specific fields of collaboration and better understand companies' perceptions of their contribution.

Hypotheses

To answer the RQs above, we developed six hypotheses. These hypotheses were derived from literature and expert workshops with public and private practitioners.

Research question 1

With regards to *H1* and *H2*, contractual relationships and reputational considerations are often the most important motivating factors for companies if it comes to crisis collaboration (Blomqvist *et al.*, 2005). *H1* refers to a fundamental motivational tension, which companies face when confronted with a supply crisis. On the one hand, companies need to run profitably in the long run to withstand competition.

On the other hand, given that managers consider providing assistance: Are they willing to sacrifice daily business obligations for it? Even though a company can never sustain such prioritization of postponing daily business in the long term, the short-term willingness to do so is an essential prerequisite for voluntary contributions to crisis management.

According to Porter and Kramer (2011), corporate rewards for private sector involvement in PPPs go beyond tax savings and immediate profit and CSR should be considered an important motivational factor for a sustainable value chain. It increasingly is an integral part of companies' objectives (Madsen and Rodgers, 2015; Dahlsrud, 2008). Therefore, it can be assumed that companies, for which CSR goals are critical, show a higher motivation for involvement in crisis management. Behr *et al.* (2022) found indicators for altruistic behavior during the COVID-19 pandemic in companies, contradicting – or at least complementing – the standard paradigm of pure profit orientation.

For *H1*, we expect that companies follow their business priorities even in a crisis and that they put social concerns aside:

H1. During crises, companies consider contractual business relationships as more important than mitigating suffering of population.

A company's positive reputation is reflected in a premium on the valuation of the company (Donia *et al.*, 2017). It is a decisive factor for young talents to join a company (Donia *et al.*, 2017), which is among the most important factors for running a successful business model in the long-run.

Social and humanitarian engagement are essential components of CSR activities for an increasingly large number of companies (Dahlsrud, 2008). Bealt *et al.* (2016) identified three key drivers of corporate engagement in disaster relief operations: internal ethical drivers, external stakeholder drivers and internal corporate drivers. By providing aid to society in times of a crisis, a company protects its staff and customers or creates new business opportunities (Izumi and Shaw, 2015). Hence, by investing in societal resilience, companies can improve their corporate reputation, which could pay off in the long term. In contrast, humanitarian activities are not always easy to assess in public perception, for different reasons: First, promoting corporate involvement can appear incredible from the public's point of view creating suspicion that the company is seeking to make a profit at the expense of those affected (crisis capitalism). This opportunity of "crises gains" has vehemently being denied by practitioners we talked to. Second, uncoordinated crisis involvement without experience can be risky for companies, since mistakes (e.g. distributing goods to the wrong recipient group) can happen easily, which in turn damages reputation.

As the evidence hints at a preponderance of potential reputation benefits, we assume that companies expect positive net reputation effects:

H2. Companies see reputation from a PPEC engagement as a benefit rather than a risk.

Research question 2

Companies will also attach great importance to effectiveness when supporting government crisis management. Stakeholder-related measures will also provide greater incentives for companies. If these requirements are met, PPECs are easier to establish (Dwiedienawati *et al.*, 2021). We address this in *H3* and *H4*.

Contributing resources during a crisis comes at potentially high cost, comprising delivery of goods, staff involvement and equipment usage. However, the proper promotion and the role of a company in the eyes of (potential) customers is of high importance to the financial performance (Green and Peloza, 2015). If the expected positive reputation effects of *H2* are confirmed, the question arises for public actors whether they should explicitly allow companies to promote a PPEC participation toward their stakeholders (potential employees, companies in their SC and customers). Possibly, this option could already be incentive enough for some companies to participate in a PPEC:

H3. Companies prefer the permission to promote with their PPEC-role to reimbursements of costs from public actors.

According to the United Nations Disaster Cycle, disaster management has four phases – mitigation, preparedness, response and recovery (van Wassenhove, 2006). Because each of these phases requires different tasks and resources, it is important for public actors to know which phase companies can best be deployed in and at what stage they are most likely to engage in a PPEC.

In the past, the private sector has responded to many disasters more efficiently and effectively than government agencies (Swanson and Smith, 2013). Based on that, we see three reasons why the response phase should be the phase that companies would most prefer for a PPEC contribution:

1. Preparedness measures require lengthy ex ante coordination and involve high uncertainty about the actual need. However, in immediate crisis response, companies can quickly adapt to the need during an acute crisis.
2. As they have to be raised on a continuous level before a potential crisis, preparedness measures imply a durable cost factor. Hence, these measures will most probably be too expensive and more difficult to justify internally from a company's point of view.
3. The response phase is the more effective way to gain attention for the engagement because it is visible and in urgent need. For example, Madsen and Rodgers (2015) argued that disaster relief activities promptly addressing disaster-created needs receive more stakeholder attention.

H4. Companies expect to better support governments in crisis response than in crisis preparedness or crisis recovery.

Research question 3

Resource efficiency, which we consider in *H5a* and *H5b*, is a crucial factor for company support in crisis management. It is more efficient for companies to make clearly defined contributions than to be involved in an uncertain coordination effort. This priority will be all the more pronounced the more

the companies expect public actors to call on precisely this support (Kalaitzi *et al.*, 2019).

The basic idea behind a PPEC is that companies are specialists in their respective fields of work and have the appropriate resources and know-how (Diehlmann *et al.*, 2021; Sodhi and Tang, 2021; Wiens *et al.*, 2018). Companies can contribute to a PPEC in several ways, but some will be more attractive to them than others. On the other hand, governmental actors have to coordinate numerous companies and establish a suitable distribution of tasks in a PPEC. These coordination efforts are time-consuming. Company participants at the workshop feared that a PPEC could be characterized by too much bureaucracy and too little flexibility. In contrast, providing resources (e.g. delivery of goods) should be a comparatively easy contribution, making companies more independent.

We argue that it is easier for a company to divert resources (companies can decide on their own about resources which are under their control) than to coordinate prioritization, information exchange and planning with public actors. Concerning companies' role in humanitarian operations, Diehlmann *et al.* (2021) identified ownership of physical resources and their control as a key factor in crisis management. Therefore, it can be concluded that companies see their role in a PPEC as a resource provider rather than a coordinator. In general, making monetary or product donations is common for companies themselves or in collaboration with NGOs (Bealt *et al.*, 2016):

H5a. Companies prefer provision of resources to coordinating assistance.

Furthermore, in a change of perspective in H5b, we want to find out whether companies also *believe* that they are *expected* to contribute resources or whether public actors require them to provide coordinating planning support:

H5b. Companies expect public actors to need resources from companies rather than coordinating assistance.

Survey design and data collection

The survey contains 13 questions based on the hypotheses. In addition, 12 characteristics of the respondents and their company, such as revenue, industry and the number of employees, were surveyed. The survey's targets were companies from the following industries: food retail (including wholesale), food production, health-care retail (including wholesale), health-care production and logistics.

The survey was developed with the research institute Allensbach (IfD Allensbach). The institute took over the final implementation, and data collection was carried out in July and August 2021. The survey was conducted in German and translated into English for publication.

From a sample, which is representative for German companies from the targeted industries, about 9,000 companies were randomly selected and contacted online. This yielded 398 valid replies, which corresponds to a low response rate of 4.5%. However, a low response rate is common for large-scale surveys solicited from CEOs and top managers, in particular for small companies and in the sectors of logistics, food and retail (Dora *et al.*, 2014; Ellis *et al.*, 2010). In general, company response rates lie frequently between 5% and 10% (Sroufe, 2003; Testa *et al.*, 2018), but can also be very low, like 1.7% (Porteous *et al.*, 2015) or 2.6% (Li *et al.*, 2010). Therefore, we see this issue as tolerable, in particular because the population consisted of the entire company database and not a random sample.

We used closed questions with predefined possible answers and assumed the answers to be metric data. A Likert scale with the number of options dependent on the content of the possible answers was used. The development of variables and items was partially self-constructed. We validated the relevant topics and related questions in several workshops with experts. Among other things, we defined various categories of business support options, such as support with warehousing, goods, or personnel. Other variables were set up based on literature, such as a question based on the *disaster management cycle* (van Wassenhove, 2006).

We asked questions within the areas of behavior in the event of a crisis, lessons learned from the COVID-19 pandemic, willingness and ability to provide assistance in a PPEC, requirements to engage in a PPEC and communication with public actors in the event of a crisis. The characteristics of the sampled companies are shown in Table 1.

Results

We evaluated our research questions using a confidence interval of $\alpha = 95\%$ for directly testable hypotheses, if not stated otherwise. To increase readability, we shortened most of the items within the text passages.

We also conducted correlation analyses concerning SC stage (retail or production companies), different industries (food, health care and logistics) and the company revenue for each hypothesis. Based on Moore *et al.* (2013), we interpret a correlation of two variables up to $|0.3|$ as low, between $|0.3|$ and $|0.5|$ as medium and $|>0.5|$ as strong, and correlations as statistically significant with ρ-values < 0.05.

RQ 1: incentives and barriers (*H1* + *H2*)

We asked the respondents to rate the importance of several requirements in case of a crisis on a Likert scale from one (*very important*) to five (*not important*). Contrary to our expectation, the respondents rated *reducing suffering of the population* (*Mean* = 1.43 and SD = 0.68) higher in importance than not endangering contractual business relationships (*Mean* = 1.73 and SD = 0.85). A one-sided *t*-test for the opposite direction even revealed a highly significant difference with a *p*-value of 0.000.

Hence, we reject *H1*, which points to companies having an altruistic motivation in crisis management, or at least, to have a coherent and credible CSR strategy. Nevertheless, at least part of this motivation can be profit-oriented, too, as healthy customers and employees are an important requirement for companies to perform business.

It can further be concluded, that in a crisis, to protect processes (*Mean* = 1.28), help people (customers [*Mean* = 1.63] and citizens in general [*Mean* = 1.43]) are seen most important. Profit concerns appear to be only subordinate while *long-term* (*Mean* = 1.79) considerations are significantly more

important than short-term (*Mean* = 2.96) considerations (*p*-value of a *t*-test is 0.000).

As expected, we can further observe a stronger correlation between long-term profit and *not endangering contractual business relationships* ($r = 0.21$, $p = 0.000$) than between short-term profit and *not endangering contractual business relationships* ($r = 0.14$, $p = 0.006$). This points to the fact that contractual business relationships are seen as a long-term commitment, an essential contribution to the long-term success of the company. Short-term deviations from obligations from contractual business relationships may be possible.

Furthermore, a significant and medium-strong degree of correlation exists between short-term and *long-term* profit ($r = 0.36$, $p = 0.000$). This suggests that the more sensitive respondents are to long-term profit, the more sensitive they are to short-term profit and vice versa. This indicates a general profit-sensitivity among some respondents.

We additionally performed regression analyses at various points in the statistical analysis. These were not significant with a low value of $R^2 = 0.13$ (target coefficient >0.2) in each case, so no significant relationships could be identified.

In principle, *endangering companies' operational processes* and *long-term* profit can be seen as universal barriers to companies engaging in crisis management (Tomasini and van Wassenhove, 2009). Interestingly, the importance of *reducing the suffering of the population* and *not endangering contractual business relationships* does not differ significantly between industries, supply chain stages and company size and no significant correlation exists.

To test *H2*, we asked whether respondents see a *positive reputation effect* vis-a-vis the wider public and whether they fear a possible *damage to reputation*. Both questions could be answered with *yes* or *no*. From all $n = 398$ respondents who answered both questions, the approval rate for *increase of reputation* yields a *mean = 0.41* (SD = *0.493*). A one-sided *t*-test reveals that this is significantly higher ($p = 0.000$) than for *damage to reputation* with a *Mean = 0.28* (SD = *0.451*). Although these findings show that reputation is not the predominant concern for companies in both directions, we do not reject *H2*.

Somewhat surprising, we find a low but significant positive correlation between both variables with $r = 0.231$, $p = 0.000$. One explanation for this might be the general relevance of reputation for companies. A company that possibly recognizes a positive reputation in collaborative emergency management is at the same time aware of potential negative consequences of wrongly perceived or failed relief efforts.

When it comes to the question of *damage to reputation*, differences in the answers of retail companies (*Mean* = 0.36, SD = 0.481, $n = 134$) and production companies (*Mean* = 0.25, SD = 0.434, $n = 137$) are noteworthy: The risk of potential reputation damage is rated higher by retail than manufacturing companies. Retail companies are more exposed to the public eye and therefore to greater risks in terms of possible reputation losses toward private customers. By contrast, manufacturing companies do business rather in a B2B context and therefore do not focus on the reputation aspects of a PPEC to the same extent.

Table 1 Companies' characteristics

Variable	Sample companies No.	%
***Industry* Grocery**	146	36.7
Thereof: Production	*91*	*22.9*
Thereof: Retail	*55*	*13.8*
Health care	125	31.4
Thereof: Production	*46*	*11.6*
Thereof: Retail	*79*	*19.8*
Logistics	97	24.4
Thereof: Grocery	*9*	*2.3*
Thereof: Health care	*7*	*1.8*
Thereof: Others	*80*	*20.1*
No answer	30	7.5
***Employees* 1–10**	41	10.3
11–20	183	46.0
21–100	136	34.2
>100	37	9.4
No answer	1	0.3
***Annual revenue* <10 Mio e**	256	64.3
10 Mio–50 Mio e	90	22.7
>50 Mio e	36	9.0
No answer	16	4.0
Area of responsibility of respondent (multiple answers possible)		
(Top-)Management	301	75.6
Business continuity management	140	35.4
Logistics or SCM	131	32.9
Corporate social responsibility	94	23.6
Other	34	8.5
No answer	16	4.0

Note: $n = 398$
Source: Authors' own work

RQ 2: enabling factors (*H3* + *H4*)

Regarding *H3*, *Incurred costs need to be reimbursed* was rated higher than the *Permission to promote* (*Means* 1.95 vs 2.97). A one-sided *t*-test shows a significant difference with $p = 0.000$.

Hence, we reject *H3* for respondents from every industry, supply chain stage and company size. Moreover, a weak positive correlation exists between responses to both questions ($r = 0.172$, $p = 0.001$): The more important cost reimbursement, the more important the permission to promote and vice versa. This may be because for most companies, basic requirements for a PPEC are decisive, such as protection of processes or company data, but only a subgroup also requests explicit benefits like compensation for costs and the opportunity to present themselves in a favorable light in public as part of their CSR strategy.

Respondents rate *Cost reimbursement* and *Risk sharing* on a similar level. We further find a significantly higher rating of reimbursement of investments among small companies (*Mean* = 1.91) than among large companies (*Mean* = 2.31) through a *t*-test with $p = 0.048$. This could be explained by the fact that large

companies generally possess a higher liquidity and more options for financial diversification (Soboleva *et al.*, 2018).

In alignment with *H1*, respondents rated *Operational processes* highest, followed by *No internal information to competitors* and *Public actors grant special rights*. Compared to the general importance they attach to operational process continuity, they rate its importance in a PPEC slightly but significantly lower (*t*-test: $p = 0.000$, *Means* = 1.28 vs 1.42). When collaborating with public actors, one could interpret it as goodwill, sacrifice or increased tolerance toward operational interventions.

We conclude that public actors should focus on designing compensation regulations and providing a high degree of confidentiality rather than enabling mere publicity. Moreover, public actors might have to pay even more attention to the continuity of companies' operations, e.g. by relaxing regulation, which is valued higher than monetary compensation.

Regarding *H4*, the respondents significantly prefer *immediate crisis response* to *permanent crisis preparedness* and *preparedness during an emerging crisis* (see Table 2). For both comparisons, one-sided *t*-tests reveal statistical significance of the difference in means ($p = 0.000$). Hence, we do not reject *H4*.

In addition, we find that respondents from health-care companies show a significantly higher preference for the four disaster phases, in particular for the *immediate crisis response* phase, than respondents from the food industry (*t*-test: $p = 0.000$). This indicates that the health-care industry more strongly believes in a successful collaboration with public actors than the food industry. A reason for this could be the experiences of the health-care sector with public actors during the COVID-19 pandemic. A statistically significant difference between logistics and health-care companies can only be found for the *recovery* phase (*t*-test: $p = 0.012$), which might be due to less urgent logistical activities in the last phase.

We conclude that companies prefer to avoid intense, long-term involvement. Interestingly, the correlation analysis shows a strong and significant correlation between the companies' assessments concerning support in all four phases of a crisis (see Table 2).

This indicates that some companies are willing to help in all phases, whereas others are generally less willing to help (regardless of the phase). The more companies prefer to provide immediate support, the more they would prefer to help in preparation and recovery. Hence, supportive companies tend to provide contributions and commitment throughout the disaster cycle, which represents an extension of the findings from Scala and Lindsay (2021).

RQ 3: efficient design (*H5a* + *H5b*)

To answer *H5a*, we developed an index of *Resources* and an index of *Coordination* [for the exploratory factor analysis, see Table 3(b)]. The same variable composition per index was used for H5a and H5b. *Mean* values and SD from the different types of assistance are provided in Table 3(a).

The willingness to provide *Resources* is significantly higher than to partake i*n Coordination* activities (*Mean* = 1.69, SD = 0.43, $n = 381$ compared to *Mean* = 1.76, SD = 0.63, $n = 381$; one-sided t-test with $p = 0.016$). Hence, we do not reject *H5a*.

Among the listed resources of Table 3(a), *Providing Storage* is underpinned with the highest willingness to contribute (*Mean* = 1.62, SD = 0.696). Using an ANOVA mean comparison, we find only slight and not significant differences among different industries ($\rho = 0.357$). Health-care companies responded with *Mean* = 1.56 and SD = 0.69, Logistics companies with *Mean* = 1.59 and SD = 0.66 and Food companies with *Mean* = 1.68 and SD = 0.71. This may be surprising as one could assume logistics companies have the largest storage capacities and thus should display a higher willingness to share them in a PPEC. Maybe, this is exactly because providing warehousing services is the core of their business model. A lower availability would seriously affect these companies if they had to provide these capacities without reimbursement. Interestingly, *Strategic Planning* is the most preferred relief measure. This shows that companies' willingness to support *Coordination* assistance varies concerning the time horizon. While tactical planning is closely linked to the companies' operational processes (see, e.g. Breitbarth *et al.*, 2021), considered particularly important and untouchable, strategic planning can improve ex ante coordination. With *tactical planning*, we mean, for example, capacity planning for production and logistics in the next weeks and months. *Strategic planning* can include planning of emergency stockpiling of certain essential goods. Although we can confirm *H5a*, the extensive range between Tactical Planning and *Strategic Planning* indicates the need for carefully evaluating the way how companies should

Table 2 Support in different crisis phases with correlation analysis

When do you think your company could best support public crisis management?	Total		Food		Health care		Logistics					
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Permanent crisis preparedness	Preparedness during an emerging crisis	Immediate crisis response	Recovery from long-term consequences
Permanent crisis preparedness	2.39	0.89	2.56	0.85	2.16	0.89	2.36	0.85	1			
Preparedness during an emerging crisis	2.30	0.83	2.51	0.82	2.09	0.79	2.20	0.77	0.721**	1		
Immediate crisis response	1.99	0.77	2.14	0.81	1.81	0.69	1.99	0.70	0.563**	0.564**	1	
Recovery from long-term consequences	2.34	0.81	2.48	0.84	2.14	0.79	2.40	0.73	0.453**	0.474**	0.501**	1

Notes: Left= results; $n = 373$; 1 = we can support public actors very well; 4 = we can barely support public actors Right: correlation analysis, $n = 398$; **indicates significance at $p < 0.05$

Source: Authors' own work

Table 3 Statistical analyses for *H5a* and *H5b*

Panel (a) contributions in a PPEC

Type	For each type of assistance mentioned, please indicate the conditions under which you would be willing to provide it	Mean	SD
Resources	Providing goods	1.75	0.512
Resources	Providing transportation capacity	1.70	0.594
Resources	Providing storage	1.62	0.696
Coordination	Tactical planning	1.93	0.883
Coordination	Strategic planning	1.59	0.608

Panel (b) factor analysis for resources index* and *coordinating assistance index

Type	Where do public actors need support from private companies in crisis situations?	Mean	SD	Factor loadings	
				Factor 1	Factor 2
Resources	Providing goods	0.69	0.465	0.487	
Resources	Providing transportation capacity	0.69	0.464	0.797	
Resources	Providing storage	0.54	0.499	0.675	
Coordinating	Tactical planning	0.40	0.490		0.775
Coordinating	Strategic planning	0.50	0.501		0.698

Notes: (a) $n = 381$; 1 = free of charge; 2 = against reimbursement; 3 = no willingness at all (b) $n = 398$; 0 = No support needed; 1 = support necessary
Source: Authors' own work

support in a PPEC. The relatively high SD for *Strategic Planning* indicates a controversy among respondents.

Coordination also includes the exchange of information, which requires substantial discretion and trust. It became apparent that *Information exchange with public actors* (*Mean* = 1.27, SD = 0.55) correlates significantly ($\rho < 0.01$) and on a high level of 0.64 with *Information exchange with companies from own SC* (*Mean* = 1.28, SD = 0.54; $n = 380$). Both answers are significantly ($p = 0.000$) different from the companies' willingness to do *Information exchange with competitors* (the willingness here is smaller with a *Mean* = 1.62 and an SD = 0.79). We conclude that during a crisis, companies would share information with public actors with the same high willingness as with actors of their own SC and therefore trust public actors.

Regarding *H5b*, exploratory factor analysis was conducted to examine whether the measurement items correlate deriving a meaningful index for further analysis. As the analysis revealed, the Kaiser–Meyer–Olkin (KMO) criterium was 0.594, and Bartlett's test of sphericity was significant [$\chi^2(15) = 356.941$, $p = 0.000$] (Backhaus *et al.*, 2016). According to the results of these indicators, the sample was considered adequate, and all five items suitable for conducting an exploratory factor analysis.

For the complete set of items, the calculation of factor analysis yielded two factors explaining a cumulative sum of 48.810% of variance. Factor 1, comprising the equally weighted items of "*production of goods*," "*transportation of goods*" and "*storage capacities*," explained 28.724% of the variance with factor loadings from *0.797* to *0.487* [the statistical results of the exploratory factor analysis using maximum likelihood and varimax rotation are presented in Table 3(b)]. Factor 2, which comprises the equally weighted items "*tactical planning*" and "*strategic planning*," explained 20.086% of the variance with factor loadings from *0.775* to *0.698*.

For Factor 1, we obtain a Cronbach's α of 0.684 ($n = 398$) and for Factor B 0.702 ($n = 398$) respectively. Both values are acceptable to proceed (Grau, 2007). We conclude that both perspectives, what companies want to provide (*H5a*) and what they think that public actors need from them (*H5b*), appear consistent. When asked about the needs of public actors, companies responded with a *Mean* = 0.639 and an SD = 0.373 ($n = 398$) in favor of the *Resources*, which is significantly higher (one-sided t-test with $p = 0.000$) than Coordination (*Mean* = 0.451, SD = 0.436; $n = 398$). Again, no significant correlations are observable in SC stage, industries or company revenue.

We do not reject *H5b*. Summarizing the results from *H5a* and *H5b* to answer *RQ3*, public decision-makers must consider the company preferences for relief measures. We found in *H5a* that companies showed a preference for supporting with *Resources* rather than Coordination. Because companies expect public actors to need more support i*n Resources* than i*n Coordination*, little compensatory regulation might be necessary. However, for specific support measures like providing goods, companies correctly anticipate a high need from public actors but are less willing to support without compensation. This indicates a greater need for compensatory regulation i*n Providing goods*.

Discussion and conclusion

Theoretical implications

Our sample of 398 surveyed companies showed a high willingness to contribute to crisis management. However, companies need clarification and commitments from public actors to join PPECs. We found differences in the willingness to engage in possible tasks as well as different ideas regarding the preferred contribution. Our results complement the now pervasive literature on humanitarian logistics. Companies' involvement is often limited to a few "big players," such as DHL, UPS or FedEx, which have specialized in global emergency operations with a logistical focus (Binder and Witte, 2007). In local crises, however, spontaneous assistance is often provided by regionally based SMEs, which is rarely documented in literature due to its case-by-case nature, and of which civil protection authorities and researchers just learn about by chance through their network (Hunt and Eburn, 2018). As our study with a large survey showed, also among small and medium companies, there is a clear willingness to get involved in a PPEC.

It is also evident that many requirements for a collaboration between the humanitarian and private sectors are highly relevant to public–private collaboration (Fontainha *et al.*, 2016). This applies, for example, to the frequent problem of unspecified (or insufficiently specified) needs, as well as attention to the core competences of companies. As our study showed, companies not only have a clear idea of what they can best deliver, but also of what is likely to be needed in an emergency. Tomasini and van Wassenhove (2009) proposed a metrics system (similar to a scorecard) for this purpose, which can help to better match partners' fit in terms of motivation, needs and competencies. Although it is impossible to predict the exact needs of the next crisis event in advance, even rough categories are beneficial. The categories used for our survey can serve as an initial orientation and contribute to the basic concept of such a scorecard.

Managerial implications

When asked for preconditions to engage in a PPEC, companies put highest priority on protection and stabilization of business processes. In particular, continuity of processes and protection of internal data toward competitors are most important. Beyond that, companies wish to be granted special rights in a PPEC.

This need for law adjustment and regulatory relief was highlighted particularly by logistics companies, which indicates that they perceive their operations as especially regulated by governments. Relaxing these regulations thus offers public actors leverage for collaboration with logistics companies in times of crisis. Moreover, especially logistics companies do not want to endanger contractual business relationships in a crisis. Reasons for that might be performance-related payments in the logistics sector and the competitive transportation market in Europe. This lack of flexibility can impede short-term collaboration with public actors. Therefore, the latter should either set up specific, flexible contractual agreements with logistics companies or find ways of collaboration that do not endanger business relationships. One example would be that public actors provide a driver for a logistics company's idled truck, as observed recently in the UK during the Brexit-induced shortage of fuel and truck drivers, where soldiers drove trucks (Kennedy, 2021).

Large companies of any industry are more afraid to endanger existing business relations through a PPEC than small companies. Hence, if public actors aim to collaborate with large companies, they should focus on a collaboration that minimizes the risk of undermining the partaking companies' business relationships. Although small companies are likely to possess fewer resources, they are more flexible in adapting their operations to the needs of public actors.

Furthermore, public actors should prefer collaboration with companies with robust operations to less robust ones. Although it is difficult to identify such companies, this aspect indicates that there are two reasons to favor companies with high competence in crisis management: First, these companies could most effectively contribute to a PPEC and second, these companies have comparatively low opportunity cost for their engagement due to robust and agile operations. Due to more and more large-scale crises and a growing application of supply chain risk management, one can expect that more robust supply chains lead to greater acceptance of a PPEC being part of companies' future operations.

Putting our research results into context of the findings of other researchers regarding potential contributions to a PPEC from the company's side and the possible division of labor, our results generally meet public and private characteristics described in section Literature review and show that companies of all types would see themselves in a PPEC as a provider of storage and transportation resources and goods rather than coordinating assistance.

However, we conclude for companies in the food industry that more clarification from public actors might be necessary about what can be done by the companies, and how the companies may benefit from such collaboration. For such support, companies demand monetary compensation, especially small companies. Hence, public actors should realistically plan for these costs from the outset and be willing to pay up – even for such things as provided data as part of a long-term collaboration.

However, we observed that the more benefits respondents see in a PPEC, the less monetary compensation they expect for their contribution to a PPEC. This suggests that public actors' communication of a PPEC's benefits can lower companies' compensation claims. Therefore, a dual strategy is recommended for the public sector. On the one hand, it should optimize the nonfinancial conditions for the most suitable companies and communicate their contribution extensively. On the other hand, it should be made possible by law to reimburse the particularly costly activities and contributions as quickly and with as little bureaucracy as possible.

Companies also perceive an increase in reputation as an opportunity from a PPEC. Although this is of comparably low importance to companies, it provides a lever for public actors to approach certain company types.

For health-care companies, it is more important than for others to avoid a loss of reputation in crises. In line with that, a reputation increase through a PPEC is a stronger incentive for them. Moreover, retail companies are more concerned about a reputation damage than production companies. When approaching health-care and retail companies, public actors could therefore develop strategies for public communication with society to satisfy these demands by positively highlighting a company's involvement. Due to the importance of a professional communication strategy in times of social media and the possible negative consequences of mistakes, close collaboration with communication experts is recommended. Companies could take advantage of this consulting service free of charge if they participate in a PPEC.

One major insight of the study is that 91% of the respondents replied to the question, under which circumstances they would exchange information with public actors in a crisis, with *free of charge* or *against reimbursement of costs*. Companies would be willing to share information with public actors to a larger extent than with competing companies (77%) and to the same extent with companies from their own supply chain (91%). This openness is high across industries, supply chain stages and company sizes. However, according to public actors, there is currently no such format in which companies could transfer their data. Consequently, public actors need to build upon this

Table 4 Linking the research findings to the elements of preparedness from van Wassenhove (2006)

Knowledge management	Operations and process management	Resources	Community
• Companies with robust operations might contribute more effectively and have lower opportunity costs • Show ways and initiatives for structured and safe data transfer	• See companies as a provider of storage and transportation resources and goods • Protection and stabilization of business processes • No endangerment of contractual business relationships	• Quick reimbursement of contributions • Law adjustment and regulatory relief especially for logistics companies • Optimize nonfinancial conditions for most suitable companies and communicate contribution	• Specific, flexible contractual agreements between public actors and logistics companies • In collaboration with large companies, public authorities should especially seek to stabilize business relationships • Develop strategies for public communication when approaching health-care and retail companies • Reduction of companies' effort in non-crisis times

Source: Authors' own work

potential and show ways and initiatives for structured and safe data transfer.

The general preference of companies is to keep their effort in a PPEC low in noncrisis times and become active in immediate crisis response. Therefore, public actors should set up a PPEC framework of low effort for companies in noncrisis times (e.g. establishing data transfer and developing communication networks but reducing or avoiding crisis exercises and extra resources), which becomes logistically active in crisis response. Because companies fear legal risks and unclear consequences of collaboration, public actors should additionally be precise and transparent about the company's tasks and obligations.

On the business side, corporate managers can use the findings of the study as support for their own decision whether to collaborate with public actors and interpret them as a benchmark attitude of companies. When presented with a summary of our results and findings, experts from public actors and companies generally validated them. They were in strong agreement especially regarding the areas that companies expect public actors to need support (*H4*) and companies' preferred ways of contributing to a PPEC (*H5a*). Insights about general priorities can be used by corporate managers to better coordinate a company's crisis management with suppliers, customers and logistics service providers. The high willingness across all respondents to share data in a crisis (with companies from their own supply chain and public actors) should encourage them to intensify data exchange with other companies to increase resilience along their supply chains.

We sum up the managerial implications and propose an initial draft of a structured PPEC framework from a public actor perspective in Table 4.

Limitations and future research

We faced a relatively low response rate of below 5%, potentially causing self-selection and nonresponse biases. Nonresponse bias occurs if nonrespondents differ in attitudes from respondents, but this is mitigated by using the entire company database as our basic population. Self-selection bias implies that responding companies are exceptionally committed to the topic, making them suitable candidates for public–private collaboration. This bias is less problematic as our goal is precisely to identify suitable company candidates for collaboration. Self-selection thus supports the identification task.

The responses were mostly homogeneous across company sizes, type of industry and supply chain stage. However, with regards to reputation aspects, especially the health-care industry results have to be carefully evaluated, as this industry was and is in the focus of public attention during the COVID-19 pandemic. This might imply an increased importance of the topic for the health-care industry.

We cannot exclude a social desirability bias, especially when it comes to the aspects of humanitarian engagement, reputation, promotions and other related fields, which we consider in our study. While we fully believe the answers of our participants to be honestly given, the mere conviction, opinion or attitude on a subject is ultimately only of limited reliability, because entrepreneurial decisions of this kind have to be made under strong restrictions (competition, cost pressure, etc.). We have tried to minimize this problem, as the survey was conducted completely anonymously by a neutral third party.

In this way, we motivated participating companies to give honest answers without being afraid of receiving bad publicity.

Conclusion

Summing up our main results: First, we found that most queried companies have already been active and are willing to engage in humanitarian actions. Second, companies prefer to help when a crisis has occurred and not in a preventive manner. Third, these companies were open to discussing and implementing PPECs to improve crisis management. Fourth, when it comes to concrete actions, companies prefer spending resources to coordinate tasks and are open to sharing data, which is not yet the case. Public actors need to consider the financial hurdles and provide compensation for any resources and coordinating tasks that arise for the respective companies. Thereby, our study is the first to provide an overview of the perspective of companies operating in the fields of logistics, food and health-care industries toward PPEC.

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