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Entrepreneurial finance in Europe and the Russian war against Ukraine

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Abstract

Prior research has investigated how the prices of stocks and commodities as well as inflation levels have been affected by the Russian war against Ukraine. So far, however, we know little about the impacts of the war on the entrepreneurial finance sector. Prior research on the effects of unexpected exogenous crisis events on entrepreneurial finance suggests a strong negative impact on new and follow-on funding for entrepreneurial ventures. Our study regards the Russian war against Ukraine as an unexpected exogenous crisis event and explores its impact on the entrepreneurial finance sector. It goes beyond a mere sentiment and impact analysis and also explores the underlying reasons and mechanisms as well as potential response and coping strategies employed by entrepreneurial finance investors. Based on two surveys of European venture capital (VC) and private equity (PE) investors, we find that the war had a strong negative impact on the two types of investors and their respective funds. Both VC and PE investors report more risk-aversion of limited partners (LPs) and LPs leaving the market as important challenges resulting in an overall lower willingness of LPs to invest. This applies in particular to banks, insurance funds, and pension funds. On the portfolio firm level, securing equity financing and maintaining liquidity were considered pressing issues. Overall, the situation seems to be more difficult for portfolio companies of VC as compared to PE investors. For the former, the financing- and liquidity-related issues seem to be more existential and survival-threatening. Responding to these challenges, both VC and PE investors altered their industry focus and put more emphasis on entrepreneurial experience. Financial investment selection criteria such as financial valuation, profitability, and cash- as well as revenue-generating capacity also increased in importance. Again, differences between VC and PE investors exist. Our study has implications for entrepreneurial finance theory and practice and concludes with an agenda for research on the impacts of the Russian war against Ukraine on entrepreneurial finance.

Keywords Entrepreneurial finance · Russian war against Ukraine · Venture capital · Private equity · Exogenous crisis

JEL Classification G24 · M13 · N44

1 Introduction

The Russian war against Ukraine that started with the invasion of Russia into Ukraine on February 24th, 2022, is described as a turning point for the economic and geopolitical situation in Europe and worldwide. It does not only impose a terrible human cost but has also strongly affected the (European) economy. While the long-term and historical impacts of the war cannot be assessed at this point, the short-term impacts are already massive (Audretsch et al., 2023; Liadze et al., 2023). Prior research has investigated how stock markets, commodities markets, and inflation levels have been affected by the Russian war against Ukraine (Derindere Köseoğlu et al., 2023; Izzeldin et al., 2023; Maurya et al., 2023). A number of event studies show severe negative impacts of the war on stock markets in Europe (Ahmed et al., 2023; Kumari et al., 2023) but also outside Europe (Bou-baker et al., 2022; Kamal et al., 2023). Such negative impacts do not come as a surprise as public finance and investments into public stocks are very mobile and can be reallocated at little cost when a conflict emerges. The situation is different for private and (in particular) entrepreneurial finance markets, which are less informationally efficient, transparent and liquid. The entrepreneurial finance market is also very heterogenous and consists of different players with a wide spectrum of motivations, capabilities and investment approaches (Block et al., 2018).

So far, we know little about the impacts of the Russian war against Ukraine on the entrepreneurial finance sector. From prior entrepreneurial finance research on the effects of unexpected exogenous crisis events, we expect a strong negative impact on new and follow-on funding for entrepreneurial ventures (Bellavitis et al., 2022; Block & Sandner, 2009; Brown & Rocha, 2020; Chandler et al., 2021; Conti et al., 2019). So far, however, this literature stream was not able to go deeper and collect evidence on the exact reasons for the funding gap following an unexpected crisis event such as the Russian war against Ukraine. In particular, we lack detailed and precise information about the severity and types of impacts as well as the underlying mechanisms. We also lack evidence on potential response and coping strategies employed by entrepreneurial finance investors and their portfolio firms. Yet, a better understanding of these impacts, mechanisms, and coping strategies is needed for both investors and policy-makers to organize effective support for innovative ventures. Such a support is crucial due to the importance of the sector for innovation, technology transfer and entrepreneurship.

Against this background and distinguishing between venture capital (VC) and private equity (PE) firms, our empirical study explores the following interrelated research questions: How did the Russian war against Ukraine change the situation for VC and PE investors in Europe? What fundraising and operational challenges exist and what do these challenges imply for the portfolio companies of VC and PE firms? How did VC and PE investors react to these challenges and adapted their investment strategy and investment selection criteria? Can we observe differences in how the Russian war against Ukraine affected VC and PE firms and their portfolio companies?

To explore these questions, we conducted two surveys of VC ($N=443$ respondents) and PE mid-market (MM) fund managers ($N=224$ respondents), which took place between the 13th of July and the 29th of August 2022 (VC) and between the 14th of July and the 29th of August 2022 (PE MM). The fund managers were asked to assess the market sentiment, report their challenges associated with the war and the macroeconomic environment as well as their reactions towards these challenges.

The market sentiment experienced a strong decline for both investor groups. Both VC and PE fund managers experience more risk-aversion of LPs and report LPs leaving the market. The increased risk aversion results in an overall lower willingness of LPs to invest in VC or PE funds. This applies in particular to banks, insurance funds, and pension funds. Besides these fundraising issues, the fund managers also experience several operational challenges such as the liquidity needs of portfolio companies, increased regulation and bureaucracy in fund management, as well as reduced exit and divestment opportunities. Regarding their portfolio companies, the fund managers list securing equity financing, maintaining liquidity, rising interest rates, and inflation levels as the most pressing issues. Apart from these financing issues, portfolio companies experience several product-related, market, and operational challenges resulting from the war and the new macroeconomic and geopolitical situation. Overall, the situation seems to be more difficult for the portfolio companies of VC than for those of PE investors. For the former, the financing- and liquidity-related issues seem to be more existential, threatening firm survival. In response to these challenges, both VC and PE investors adapted their investment strategies regarding preferred industries and placed more emphasis on the experience of the entrepreneur. Financial investment selection criteria such as financial valuation, profitability, and cash- as well as revenue-generating capacity, gained importance. Again, differences between VC and PE investors seem to exist. The war and the associated economic and geopolitical situation had a stronger impact on the investment strategy of VC than on that of PE investors. Heterogeneity analyses show that among investors gender differences in the evaluation of the unexpected exogenous crisis exist and that investors from Eastern Europe assess the fundraising situation more pessimistic than their counterparts from the rest of Europe.

Our study contributes to four areas of entrepreneurial finance and entrepreneurship research. The first contribution is to research on the effects of unexpected exogenous crisis events on entrepreneurial finance (Alperovych et al., 2015; Bellavitis et al., 2022; Block & Sandner, 2009; Brown & Rocha, 2020; Chandler et al., 2021; Conti et al., 2019; de Vries & Block, 2011). As described above, prior research has already looked at the effects of different types of unexpected exogenous crises on entrepreneurial finance. However, the current crisis is different. First, the reason for the crisis does not lie in the financial system itself but is the result of war and its geopolitical and macroeconomic consequences. Second, the crisis (event) does not equally affect all parts of the world but has a particularly strong impact in Europe. Our study goes beyond a mere sentiment and impact analysis and also explores the underlying reasons and mechanisms as well as potential response and coping strategies employed by entrepreneurial finance investors. This is novel to the literature. Heterogeneity analyses further show that among investors gender differences in the evaluation of the unexpected exogenous crisis exist, which connects our study to research on the impacts female representation in VC firms (Xu et al., 2024). The second contribution of our study is to the literature on the role of LPs in the VC and PE industry (Barnes & Menzies, 2005; Groh & Liechtenstein, 2011) and how they react in a situation of a geopolitical and macroeconomic crisis. The results of our study show that not all LPs show the same (negative) reaction. The reaction was particularly strong with banks, insurance companies, and other financial institutions but was less strong with government funds. This finding is in line with the idea that (in times of crisis) public money and governmental VC funds are important players in the market for entrepreneurial finance (Alperovych et al., 2015; Colombo et al., 2016; Link et al., 2021). The third contribution is to the literature on the investment selection criteria of VC and PE investors (Block et al., 2019, 2022; Gompers et al., 2020; Minola et al., 2017; Petty et al., 2023). While this literature stream is already well-developed and a good understanding exists of the importance of particular investment

selection criteria for VC and PE investors, little is known about the importance of these criteria in a situation of high geopolitical and macroeconomic uncertainty. Our study contributes to closing this gap and shows how the importance of certain investment selection criteria of VC and PE investors change in a situation of a geopolitical and macroeconomic crisis. In particular, financial criteria and entrepreneurial experience become more important. The fourth contribution is to the literature on entrepreneurship in conflict countries (Brück et al., 2013; Moritz et al., 2023; Naudé et al., 2023). Judging from the answers of those investors with an investment focus in Eastern Europe, it seems that the (short-term and immediate) impact of the war on entrepreneurship is clearly negative. This finding is in line with the results of Naudé et al. (2023) showing a negative relationship between state-based conflict and productive entrepreneurship.

The remainder of the study is organized as follows: Sect. 2 summarizes background and related literature. Section 3 presents the samples, questionnaires, and summary statistics. Sections 4 and 5 report the market sentiment of the VC and PE investors and the concrete challenges associated with the Russian war against Ukraine. Section 6 shows the reactions of the VC and PE investors toward these challenges. Section 7 conducts heterogeneity analyses splitting the sample by geography and gender. Section 8 discusses our results while Sect. 9 presents a detailed agenda for further research on the impact of the Russian war against Ukraine on entrepreneurial finance.

2 Background and related literature

This section provides a summary of background and related literature. It starts with an overview of prior research on the impact of unexpected exogenous crisis events on entrepreneurial finance. Next, there is a brief discussion on the characteristics of VC and PE investors and how they may lead to different reactions towards such crisis events. The section closes with a discussion of entrepreneurial opportunities in (post-) conflict countries and the role of entrepreneurial finance.

2.1 (Un)expected exogenous crisis events and entrepreneurial finance

A number of studies have analyzed the relationship between *expected* exogenous, more long-term crisis situations and entrepreneurial finance. A good example of such a crisis would be the climate crisis and its policy responses. A literature stream has emerged about VC investments into cleantech (Bürer & Wüstenhagen, 2009; Croce & Bianchini, 2022; Cumming et al., 2016). Within this literature stream the study by Hofman and Huisman (2012) has investigated how the 2008–2009 financial crisis changed the popularity of environmental policies and the preference of VC investors to invest in cleantech. They found that the financial crisis decreased the popularity of market-pull policies such as subsidies and trade related schemes (e.g., CO₂ emissions and green certificates trading).

Our study is related to the study by Hofman and Huisman (2012) as it connects to prior research on the effects of *unexpected* exogenous crisis events on entrepreneurial finance. In this literature stream, Block and Sandner (2009) analyzed the effect of the 2008–2009 global financial crisis on the VC market. They found that the financial crisis led to a 20% decrease in the average amount of funds raised per funding round. The effect, however, could only be detected in later funding rounds. Adding to this, De Vries and Block (2011) show that the financial crisis (but also the dot-com crisis) was

associated with a lower tendency to co-invest and led to a lower overall size of the syndicates. Conti et al. (2019) report that VCs in the global financial crisis, in particular the more-experienced ones, changed their investment strategy and allocated more resources to their core investment sectors. Using Belgium data from the dot-com crisis, Alperovych et al. (2015) show that VC behavior in a crisis differs for private versus governmental VC firms. While private VC funds reduced their investments, governmental VC funds acted countercyclically and increased their investments. Focusing on the COVID-19 pandemic, Bellavitis et al. (2022) show that the pandemic was associated with a significant decline in VC investments across the world, particularly regarding early-stage ventures. Nonetheless, Crisanti et al. (2021) report that despite the measurable harm of the initial 2020 lockdowns, the VC industry did not suffer from a case of long COVID; and that by the end of 2020, VC firms under strict lockdown had caught up in terms of activity rate (both in deals and volumes) with their no-lockdown benchmark. Entrepreneurial ventures in their early stages are often financed by business angels. Mason and Harrison (2015) have analyzed the investment behavior of UK business angels (BAs) in the 2008–2009 global financial crisis. They find that the investment activity of BAs has increased in the number of investments but decreased in the amount invested. The significance of co-investment has increased, both between business angels and between business angels and investor types. Using firm-level data after the 2008–2009 global financial crisis, Casey and O'Toole (2014) show that bank-lending constrained small firms substitute bank loans to some extent with trade credit, informal lending, and loans from other companies. Market financing through issued debt or equity did not increase. The additional use of trade credit was found to be higher for firms owned by VCs or BAs. Related to this, Berger et al. (2023) show in a broad international study based on data from more than 18,000 loans that financial crises yield both price and quantity rationing of creditworthy borrowers. Comparing publicly-listed and privately-held firms, they find that publicly-listed firms often face price rationing while privately-held firms often face quantity-rationing. In a recent study, Baltas et al. (2022) show that alternative finance (comprising PE, VC, and crowdfunding) is an important source of funding for firms hit by a natural disaster. The use of alternative finance is found to increase after the occurrence of a natural disaster—the effect being stronger for larger and older firms as well as firms with a higher reliance on physical assets.

2.2 Characteristics of VC versus PE investors

Our study compares the immediate impact of the Russian war against Ukraine on VCs and PEs as two important entrepreneurial finance investors. Even though the two investor types share many similarities in their investment model and investment approach, some important differences exist that could lead to different reactions to unexpected exogenous crisis events. While VC investors mostly invest in young and small firms that are innovative and have high-growth potential, PE investors tend to invest in larger, more established firms with a stable cash-flow and a proven business model. The investment sizes and equity shares of PE investors are larger than those of VC investors. Yet, the overall number of deals is typically higher for VCs as compared to PEs and also the likelihood to syndicate is higher. With regard to similarities, both VC and PE investors hold their portfolio companies for a limited time period and want to exit their investments after some years preferably through trade sales or IPOs. They also draw on a

similar pool of limited partners (LPs) such as banks, insurance funds, family offices, foundations, and government funds.

2.3 Entrepreneurial opportunities in (post-) conflict countries

The paper also relates to the growing literature on entrepreneurship in (post-) conflict countries (Brück et al., 2013; Moritz et al., 2023; Naudé et al., 2023). During the time of the conflict, the conflict is likely to reduce entrepreneurial opportunities and damage the institutions that are needed to attract entrepreneurial finance and other resources. In a recent study, Naudé et al. (2023) show that there is a negative relationship between state-based conflict and productive entrepreneurship exploiting entrepreneurial opportunities. Yet, the situation can change in post-conflict times, where there is a strong need to replace or repair damaged assets. The conflict may also lead to a (permanent) increase in military expenses. In such a situation, opportunities for entrepreneurs and entrepreneurial finance investors emerge. Accordingly, the post-war Ukraine is described by some to “become one of the best in the world in terms of opportunities for investors” (The Epoch Times, 2023). Irrespective of whether such a situation will eventually occur, large investment companies such as BlackRock are already securing contracts to rebuild Ukraine after the war. Prior research shows that public (entrepreneurship) policy together with a stable institutional environment can attract badly needed capital to finance post-conflict growth (Hisrich et al., 2016). Using data from Kosovo, Krasniqi and Branch (2020) show that in the aftermath of the Kosovo war, the number of start-ups has increased rapidly. Yet, many of these newly founded firms stayed small which the authors attribute to corruption and administrative burdens that hinder these firms from growing. The effect was opposite for larger and established firms which were to create links with public officials to manage the institutional deficiencies of a post-conflict country.

3 Data and method

3.1 Samples and summary statistics

The datasets used in this study are derived from two extensive pan-European surveys of PE and VC fund managers/general partners (GPs); namely the ‘2022 Private Equity Mid-Market Survey’ (PE MM Survey) and the ‘2022 Venture Capital Survey’ (VC Survey), conducted by the European Investment Fund (EIF). To the best of our knowledge, the two surveys combined represent the largest survey of fund managers/GPs in Europe overall, but also dedicated to the topic of the Russian war against Ukraine and the resulting challenges. Both surveys were conducted online, and anonymized responses were received in July and August 2022.

While the PE MM and VC surveys target different groups of recipients, they share a similar questionnaire design and similar questions. Each survey participant was asked a total of up to 73 questions. These included single-choice, multiple-choice, and ranking questions, as well as free-text inputs. For our study, we primarily draw on the survey questions focusing on how the Russian aggression against Ukraine and the associated geopolitical and macroeconomic implications have affected entrepreneurial finance investors in Europe. These questions concerned changes in investment strategy and

investment selection criteria as well as information about fundraising and operational issues on both fund and portfolio company levels. In addition, the dataset includes rich information on the demographics of the respective PE and VC fund managers, as well as their respective PE/VC firms. For more information on both surveys, please refer to Kraemer-Eis et al. (2022a, 2022b).

The surveys originally targeted 3308 PE and 4866 VC fund managers, representing 1615 distinct PE and 2461 distinct VC firms, respectively. The list of PE and VC firms, as well as the details of relevant contacts within each firm, were obtained from Pitchbook. The VC sample was also enriched by contacts provided by Invest Europe (formerly European Venture Capital Association, EVCA) and the EIF.

The final dataset used for the analyses contains completed responses from 224 PE fund managers (representing 188 distinct PE firms), and 443 VC fund managers (from 362 VC firms). Response rates (at the fund manager level) were therefore 6.8% (PE survey) and 9.1% (VC survey). These response rates are comparable to other email-distributed academic surveys addressed to investors (e.g., Amel-Zadeh & Serafeim, 2018; Block et al., 2019). The vast majority of respondents hold the position of CEO or managing or general partner in their respective firms. This implies that while the analyses of this study are based on stated preferences, the data and responses collected represent the views of senior decision-makers.

Tables 8, 9, 10 and 11 in the appendix report summary statistics about the survey respondents. The vast majority of respondents—87% (VC survey) or 84% (PE survey)—were male; most respondents were between 45 and 55 years old, and their mean experience as fund managers was 13 years (VC survey) or 18 years (PE survey). The assets under management varied substantially: 22% of VC investors (11% of PE investors) had less than 50 million Euros; 9% of VC investors (15% of PE investors) had more than 1 billion. The median firm age was 11 (VC) and 14 years (PE), respectively, at the time the survey was conducted. The majority of VC investors invested in seed (33%) or early-stage ventures (35%), while most PE investors provided funding for venture growth (32%) or buyout situations (63%).

The PE and VC investors contacted were predominantly headquartered in the 27 EU countries, but also in other countries, such as Norway, Switzerland, Turkey, Israel, the United Kingdom, and the USA. The most prominent locations for VC investors were Germany (13%), the UK (10%), the Netherlands (10%), France (8%), and Spain (7%). For the headquarters of the PE investors, the most prominent locations were France (15%), Italy (12%), Germany (9%), the UK (9%), the Netherlands (7%), and Spain (7%). With regard to the industry or sector focus, VC investors were mainly active in Information and Communications Technologies (ICT) (31%), Biotech/Healthcare (20%), and Energy/Environment (12%); PE investors had a focus on Business Services (26%) and Business Products (18%), as well as on Biotech/Healthcare (13%). A further 19% (8%) of the PE (VC) investors reported having no clear sector focus.

3.2 Questionnaires, scales and items

We did not discover any prior questionnaire study on the impact of exogenous crisis events on entrepreneurial finance and hence we had to develop our own questionnaires, scales, and items. We did so based on our own experience as researchers and based on intensive conversations with entrepreneurial finance investors and their industry

associations. The exact formulations of the questions and the corresponding scales and items are provided in the respective notes of the results tables.

4 Market sentiments of VC and PE investors

The reports by Kraemer-Eis et al. (2022a, 2022b) describe the market sentiments for the fundraising environment of VC and PE investors over time. The VC and PE fund managers were asked about their expectations for the fundraising environment. The question posed to them was “Over the next 12 months, how do you expect the fundraising environment to develop?”. The answer options were ‘slightly/strongly deteriorate’, ‘stay the same’, and ‘slightly/strongly improve’. We calculate the percentages in each of the three categories as well as the net balance. A negative net balance means that the negative answer categories were reported more frequently than the positive categories.

The Russian invasion of Ukraine and the related geopolitical and macroeconomic developments hit the European VC and PE markets at an exceptional time. Following a slump in the European VC and PE market activity during the COVID-19 pandemic in 2020 (net balance VC: −18%; net balance PE: −60%), the market sentiment had just recovered in 2021 (net balance VC: 24%; net balance PE: 30%). Fundraising and investments were at record highs, driven to a large extent by the strong growth in various sectors (e.g., the digital economy, but also the health and biotech sectors) during the pandemic and additional government funds allocated to European VC markets (OECD, 2023).

This positive evolution turned around in 2022 (net balance VC: −43%; net balance PE: −50%). Despite a still relatively robust investment and fundraising activity during the first part of the year (Invest Europe, 2022), the market sentiment that VC and PE fund managers expressed in the surveys declined substantially, indicating significant headwinds for the near future. While the situation in 2022 was still assessed to be positive in many aspects of the VC/PE activity, in particular the expectations deteriorated strongly.

5 Challenges for VC and PE investors

5.1 Fundraising challenges for VC and PE investors

5.1.1 Overall picture

Table 1 displays the fundraising problems of VC and PE investors associated with the Russian war against Ukraine and the changes in the macroeconomic and geopolitical environment. The fund managers were asked about the extent to which certain items in a selected list of challenges constitute a fundraising problem for their fund. For each challenge, we calculated the number and percentage of respondents considering the respective challenge as either ‘no problem at all’, ‘minor problem’, ‘important problem’, or ‘existential problem’. Column I (II) shows the answers of the VC investors (PE investors) and Column III reports the results of a test of equality of proportions, including the associated measure of statistical significance, the *p* value.

The overall extent of fundraising challenges seems higher for VC than PE investors. The ranking of the top challenges, however, seems to be similar. Both VC and PE investors

Table 1 Fundraising challenges for VC and PE investors

| Fundraising challenges | I | II | III |
|---|-----------------------------|-----------------------------|---|
| | VC investors (N=443) (%) | PE investors (N=224) (%) | Test of equality of proportions Difference (%) <i>p</i> value |
| More risk-aversion of LPs | 67.5 | 52.2 | 15.3 0.000 |
| LPs leaving the VC market/the PE mid-market sector | 60.9 | 48.2 | 12.7 0.002 |
| Rising interest rates | 48.3 | 37.9 | 10.4 0.010 |
| Rising levels of inflation | 39.5 | 37.9 | 1.6 0.698 |
| Shift of venture stage focus of LPs/investment stage focus of LPs | 37.9 | 26.8 | 11.1 0.004 |
| Increased regulations and bureaucracy | 35.0 | 30.4 | 4.6 0.232 |
| Shift of geographical focus of LPs | 32.3 | 41.5 | -9.2 0.020 |
| Shift of sector focus of LPs | 30.0 | 21.9 | 8.1 0.026 |
| Changes in fundraising terms and conditions | 26.0 | 26.3 | -0.3 0.916 |
| New political goals of LPs | 24.2 | 28.1 | -3.9 0.267 |
| Travel restrictions making fundraising difficult | 14.9 | 15.6 | -0.7 0.805 |
| Sanctions on high-net-worth individuals | 11.3 | 9.8 | 1.5 0.565 |

This table displays the percentage of VC and PE investors who consider the respective issues as 'important' or 'survival-threatening' fundraising problems. The question asked was: "Considering the current geopolitical situation and macroeconomic environment, to what extent do the following issues constitute a fundraising problem for your VC fund(s)/PE mid-market fund(s)?" We report the results separately for VC and PE investors (Column I or II, respectively). Column III displays the differences in percentages and the results of a statistical test of equality of proportions between the two types of investors

report ‘more risk-aversion of LPs’ and ‘LPs leaving the market’ as their top challenges. Both investor types also named ‘rising interest rates’ and ‘rising levels of inflation’ as important challenges. However, differences between the investors can still be observed. For example, PE investors consider the ‘shift of geographical focus of LPs’ to be a more important issue compared to VC investors (32% for VC vs. 42% for PE, $p < 0.05$). The two least important challenges were ‘sanctions on high-net-worth individuals’ and ‘travel restrictions making fundraising difficult’.

5.1.2 Changes in the willingness of different LPs to invest in VC/PE funds

Table 2 displays the perceived willingness of different LPs to invest in VC (Column I) or PE funds (Column II). Column III reports the results of a statistical test of equality of means (using the numerical values value behind the qualitative answer options). Regarding the willingness of LPs to invest in VC or PE funds as an asset class, we asked the fund managers to compare the current situation against the one before the war in Ukraine. In concrete terms, we asked the VC and PE investors to assess the willingness of different types of LPs to invest in VC or PE as an asset class on a four-point scale ranging from ‘better than before the war in Ukraine’ to ‘significantly worse than before the war in Ukraine’. The LP categories displayed in the survey were ‘banks and other finance companies’, ‘insurance funds’, ‘pension funds’, ‘government funds’, ‘corporate investors’, ‘endowments’, ‘foundations’, ‘family offices’, and ‘high-net-worth-individuals’.

The LPs whose willingness to invest changed the most were ‘banks and other finance companies’, but also large private institutional investors (such as ‘insurance funds’ and ‘pension funds’) and ‘high-net-worth individuals’. The LP whose willingness to invest changed the least was ‘government funds’. Some differences between the VC and PE markets exist. PE investors suffer significantly more than VC investors from the reduced willingness of ‘endowments’ and ‘foundations’ to invest ($p < 0.05$ for both).

5.2 Operational challenges for VC and PE investors

Table 3 compares the concerns and operational challenges that VC and PE investors (Columns I and II, respectively) face about the war and the changed macroeconomic and geopolitical situation. Column III displays a test of equality of proportions. The fund managers were given a list of operational challenges and had to answer the following question: “Considering the current geopolitical situation and macroeconomic environment, to what extent do the following operational issues constitute a problem for your VC/PE fund?”. We report the combined percentage of answers where the respondent considered the respective challenge to be either ‘important’ or ‘survival-threatening’.

The ranking of important or survival-threatening operational challenges is somewhat different between the two types of investors. While VC investors consider the ‘liquidity needs of portfolio companies’ (52%) as the most important issue, for PE investors, it is ‘more regulation and bureaucracy in fund management’ (34%) that presents the biggest challenge. Both VC and PE investors regard a ‘reduced set of divestments and exit opportunities’ (VC: 44%, PE: 33%) as an important or even survival-threatening operational issue. The same is true for the ‘decreased operational performance of portfolio companies’ (VC: 32%, PE: 33%) and ‘decrease in overall levels of venture valuation’ (VC: 31%; PE: 30%). The operational challenges which are considered least important are ‘defaulting LPs’ (VC: 8%; PE: 5%) and ‘travel restrictions impacting selection and

Table 2 LPs' willingness to invest in VC and PE funds compared to before the war in Ukraine

| Different LPs | I | | | | II | | | | III | |
|-------------------------------|--------------|-------------|-----------|-------------------------|--------------|-------------|-----------|-------------------------|---------------------------|--|
| | VC (N = 443) | | | | PE (N = 224) | | | | Test of equality of means | |
| | Better (%) | Similar (%) | Worse (%) | Significantly worse (%) | Better (%) | Similar (%) | Worse (%) | Significantly worse (%) | p value | |
| Banks/other finance companies | 1.1 | 42.4 | 45.4 | 11.1 | 0.9 | 37.1 | 55.4 | 6.7 | 0.783 | |
| High-net-worth individuals | 3.2 | 45.1 | 42.2 | 9.5 | 6.7 | 46.9 | 40.6 | 5.8 | 0.166 | |
| Insurance funds | 0.5 | 43.3 | 47.2 | 9.0 | 0.4 | 43.8 | 51.3 | 4.5 | 0.334 | |
| Pension funds | 0.7 | 47.0 | 44.0 | 8.4 | 2.2 | 43.8 | 48.2 | 5.8 | 0.643 | |
| Corporate investors | 1.6 | 47.6 | 42.9 | 7.9 | 2.2 | 45.1 | 48.2 | 4.5 | 0.678 | |
| Family offices | 3.4 | 45.6 | 43.3 | 7.7 | 5.8 | 44.6 | 43.3 | 6.3 | 0.349 | |
| Endowments | 1.0 | 61.2 | 35.2 | 3.2 | 1.3 | 51.3 | 42.4 | 4.9 | 0.039 | |
| Foundations | 1.4 | 60.7 | 35.2 | 2.7 | 1.8 | 48.7 | 45.5 | 4.0 | 0.015 | |
| Government funds | 7.7 | 72.0 | 18.0 | 1.8 | 8.0 | 57.6 | 33.5 | 0.9 | 0.007 | |

This table displays the assessment of LPs' willingness to provide funding for VC and PE funds. The question asked was: "How do you assess the current willingness of different LPs to provide funding for VC/PE mid-market funds as an asset class?". We report the results separately for VC and PE funds (Column I or II) and display the percentage of responses in the respective categories. Column III displays the results of a statistical test of equality of means (using the numerical values behind the answer categories)

Table 3 The most important operational challenges for VC and PE investors

| Operational challenges | I VC investors (N = 443) (%) | II PE investors (N = 224) (%) | III Test of equality of proportions | |
|---|------------------------------------|-------------------------------------|--|---------|
| | | | Difference (%) | p value |
| Liquidity needs of portfolio companies | 51.9 | 16.5 | 35.4 | 0.000 |
| Reduced set of divestments and exit opportunities | 43.8 | 32.6 | 11.2 | 0.005 |
| More regulation and bureaucracy in fund management | 34.8 | 34.4 | 0.4 | 0.921 |
| Decreased operational performance of portfolio companies | 31.8 | 32.6 | -0.8 | 0.843 |
| Decrease in overall levels of valuation of portfolio firms | 30.7 | 30.4 | 0.3 | 0.928 |
| Lack of qualified talent for fund management | 25.3 | 21.4 | 3.9 | 0.272 |
| Increasing volatility of fund performance | 22.6 | 21.0 | 1.6 | 0.640 |
| Lack of suitable investment targets regarding investment topics | 10.4 | 17.9 | -7.5 | 0.007 |
| Lack of own experience in how to account for geopolitical and macroeconomic uncertainties | 9.5 | 10.3 | -0.8 | 0.747 |
| Lack of suitable investment targets regarding venture stage/investment stage | 8.8 | 11.2 | -3.7 | 0.330 |
| Funds' exposure to Russia, Ukraine and Belarus | 8.1 | 12.5 | -4.4 | 0.070 |
| Funds' exposure to Eastern European EU countries | 8.1 | 14.7 | -6.6 | 0.008 |
| Lack of suitable investment targets regarding geographical focus | 8.1 | 12.5 | -4.4 | 0.070 |
| Defaulting LPs | 7.7 | 4.9 | 2.8 | 0.179 |
| Travel restrictions impacting selection and monitoring of portfolio firms | 7.0 | 4.5 | 2.5 | 0.199 |

This table displays the percentage of VC and PE investors who consider the respective issues as “important” or “survival-threatening” operational problems. The question asked was: “Considering the current geopolitical situation and macroeconomic environment, to what extent do the following operational issues constitute a problem for your venture capital/PE mid-market fund(s)?”. We report the results separately for VC and PE investors (Column I or II, respectively). Column III reports the differences in percentages and the results of a statistical test of equality of proportions between the two types of investors

monitoring of portfolio firms' (VC: 7%; PE: 5%). We perceive differences in 'funds' exposure to Russia, Ukraine, and Belarus' and 'funds' exposure to Eastern European EU countries where PE investors rate the respective challenge as significantly more important ($p < 0.10$ or $p < 0.01$, respectively). Next to these differences, PE and VC investors also differed about the 'lack of suitable investment targets regarding investment topics' ($p < 0.01$). To summarize, while the operational challenges seem to be more survival-threatening for VC investors, PE investors seem to be relatively more vulnerable to their funds' exposure to Russia, Ukraine, Belarus as well as Eastern Europe.

5.3 Challenges for portfolio companies of VC and PE investors

Table 4 (Panel A to Panel C) shows the challenges for the portfolio companies of VC and PE investors about the Russian war against Ukraine and the changes in the macroeconomic and geopolitical environment. The question posed to VC and PE investors was "Considering the current geopolitical situation and macroeconomic environment, to what extent do the following issues constitute a problem for your portfolio companies?". The respondents rated a given list of challenges on a 4-point scale ranging from 'no problem at all' to 'survival-threatening problem'. We calculated for each challenge the number and percentage of respondents considering the respective challenge as either 'important' or 'survival-threatening'. Column I shows the answers of the VC investors, Column II those of the PE investors, and Column III shows a statistical test of equality of proportions. We further distinguish between 'financing-related challenges' (Panel A), 'market-related challenges' (Panel B), and 'operational challenges' (Panel C).

5.3.1 Financing-related challenges for VC and PE portfolio companies

Regarding financing-related challenges, VC investors consider 'securing equity financing' (77%), 'securing liquidity' (71%), 'reduced exit opportunities' (64%), and 'rising inflation levels' (64%) as the four top challenges for their portfolio companies. The list is different for PE investors. PE investors consider 'rising inflation levels' (88%), 'rising interest rates' (49%), 'reduced exit opportunities' (40%), and 'decreases in valuation and multiples' (37%) as the most challenging issues for their portfolio companies.

Comparing the answers of VC and PE investors, VC investors seem to be overall more concerned about their portfolio companies. Six out of the nine financing issues listed pose a greater challenge to VC compared to PE portfolio companies. The strongest differences can be observed for 'securing equity financing' (77% for VC vs. 11% for PE, $p < 0.01$) and for 'securing liquidity' (71% for VC vs. 24% for PE, $p < 0.01$). By contrast, the macroeconomic implications of the war, as reflected in 'rising inflation levels' (63% for VC vs. 88% for PE, $p < 0.01$) and in 'rising interest rates' (38% for VC vs. 49% for PE, $p < 0.01$) are more worrying for PE portfolio companies. This can be explained by the fact that portfolio companies of PE investors are typically older and more established and therefore more likely to (also) use debt financing.

Table 4 Panel A: Most important financing-related challenges for VC and PE portfolio companies; Panel B: Most important market-related challenges for VC and PE portfolio companies; Panel C: Most important operational challenges for VC and PE portfolio companies

| | I | II | III | |
|--|------------------------|--------------|---------------------------------|---------|
| | VC (N = 443) (%) | PE (N = 224) | Test of equality of proportions | |
| | | | Difference | p value |
| <i>(A) Financing-related challenges</i> | | | | |
| Securing equity financing | 77.2 | 11.2% | 66.0% | 0.000 |
| Securing liquidity | 71.3 | 23.7% | 47.6% | 0.000 |
| Reduced exit opportunities | 64.1 | 40.2% | 23.9% | 0.000 |
| Rising inflation levels | 63.2 | 87.9% | − 24.7% | 0.000 |
| Decreases in valuation and multiples | 51.7 | 36.6% | 15.1% | 0.001 |
| Rising interest rates | 37.9 | 48.7% | − 10.8% | 0.008 |
| Securing debt financing | 32.5 | 23.7% | 8.8% | 0.020 |
| Changes in other financing terms and conditions | 28.2 | 20.5% | 7.7% | 0.032 |
| Accessing public funding | 28.2 | − | − | − |
| <i>(B) Market-related challenges</i> | | | | |
| Customer acquisition and retention | 51.0 | 21.4% | 29.4 | 0.000 |
| Strong product market competition | 27.8 | 16.5% | 11.3 | 0.001 |
| Difficulties to internationalize | 27.1 | 16.5% | 10.6 | 0.002 |
| Demand shifts of customers | 26.9 | 24.6% | 2.3 | 0.522 |
| Travel restrictions | 17.4 | 12.9% | 4.5 | 0.139 |
| Export restrictions | 13.5 | 15.2% | − 1.7 | 0.567 |
| <i>(C) Operational challenges</i> | | | | |
| Shortage of skilled labor | 71.8 | 73.7% | − 1.9 | 0.610 |
| Rising labor costs | 64.6 | 79.0% | − 14.4 | 0.001 |
| Supply chain disruptions | 57.1 | 74.6% | − 17.5 | 0.000 |
| Rising energy costs | 41.1 | 80.8% | − 39.7 | 0.000 |
| Rising production costs (other than labor and energy) | 40.9 | 71.9% | − 31.0 | 0.000 |
| Potential energy shortages | 38.1 | 59.4% | − 21.3 | 0.000 |
| Increasing regulations and bureaucracy | 37.2 | 28.6% | 8.6 | 0.026 |
| Lack of experience with geopolitical and macroeconomic uncertainties | 27.5 | 19.6% | 7.9 | 0.025 |

(Panels A, B & C) displays the combined percentages for the ‘important’ or ‘survival-threatening’ financing-related challenges (Panel A), market-related challenges (Panel B), and operational challenges (Panel C) that the portfolio companies of VC and PE investors face. The question asked was: “*Considering the current geopolitical situation and macroeconomic environment, to what extent do the following issues constitute a problem for your venture portfolio companies/PE mid-market portfolio companies?*”. We report the results separately for VC and PE investors (Column I or II, respectively). Column III displays the differences in percentages and the results of a statistical test of equality of proportions between the two types of investors

5.3.2 Market-related challenges for VC and PE portfolio companies

About market-related challenges, it seems that yet again VC investors are more concerned about their portfolio companies than PE investors, with VC investors reporting higher percentages in five out of the six market-related issues listed. The two most important

challenges for the portfolio companies of VC investors are ‘customer acquisition’ (51%) and ‘strong product market competition’ (28%), while the two most important challenges for the portfolio companies of PE investors are ‘demand shifts of customers’ (25%) and ‘customer acquisition and retention’ (22%). The differences between the two investor groups are statistically significant at the 1%-level with six challenges.

5.3.3 Operational challenges for VC and PE portfolio companies

The evidence regarding the operational challenges looks a bit different. While with financing- and market-related challenges, VC investors were more concerned about their portfolio companies than PE investors, the opposite was true for the operational challenges. While both VC and PE investors considered the overall importance of operational challenges to be high for their portfolio companies, the reported percentages were higher for PE investors in six out of the eight operational issues mentioned ($p < 0.01$). The top three operational challenges for the portfolio companies of VC investors were ‘shortage of skilled labor’ (72%), ‘rising labor costs’ (65%), and ‘supply chain disruptions’ (57%). The respective list for portfolio companies of PE investors was ‘rising energy costs’ (81%), ‘rising labor costs’ (79%), and ‘supply chain disruptions’ (75%). Compared to VC investors, twice as many PE investors identify ‘rising energy costs’ as an important or even survival-threatening problem for their investees. Again, these differences between PE and VC investors can be explained by the fact that PE portfolio firms are typically older and more established and therefore more likely to have operations already in place.

6 Reactions of VC and PE investors

6.1 Changes in investment strategies

Table 5 provides evidence for the changes in the investment strategies of VC and PE investors as a reaction to the Russian war against Ukraine and the changes in the macroeconomic and geopolitical environment. The survey respondents indicated that they have changed their investment strategy, particularly concerning the ‘required experience of the entrepreneur’ and their ‘preferred sector or industry’. Eleven percent of PE investors reported that they changed their geographical focus. Overall, the changes were more pronounced for PE than for VC investors. Significant differences between the two investor types can be observed for ‘preferred sector or industry’ ($p < 0.01$) and ‘preferred venture stage/investment stage’ ($p < 0.05$).

6.2 Changes in the importance of specific investment selection criteria

Table 12 in the appendix summarizes the importance of various investment selection criteria for both investor types. Sixty-nine percent of VC investors (54% of PE investors) rate the ‘management team’ as one of their top three investment selection criteria. Among VC investors, ‘scalability of the business’ and ‘technology’ rank second and third. For PE investors, ‘profitability’ and ‘business model’ rank second and third.

Table 5 Extent of change in the investment strategies of VC and PE investors

| Response options | I | | | II | | | III | | |
|--|----------------------|---------------|-----------------------|----------------------|---------------|-----------------------|---|---|---------|
| | VC investors (N=443) | | | PE investors (N=224) | | | Test of equality of means | | |
| | Not at all (%) | Some-what (%) | To a large extent (%) | Not at all (%) | Some-what (%) | To a large extent (%) | I do not know/ prefer not to say (%) | I do not know/ prefer not to say (%) | p value |
| Required experience of entrepreneurs | 46.5 | 39.3 | 11.7 | 2.5 | 38.8 | 48.7 | 11.6 | 0.9 | 0.101 |
| Preferred sector or industry | 59.6 | 30.0 | 7.7 | 2.7 | 30.4 | 46.9 | 21.9 | 0.9 | 0.000 |
| Preferred geographical focus | 65.5 | 25.5 | 6.1 | 2.9 | 66.5 | 21.4 | 11.2 | 0.9 | 0.241 |
| Preferred venture stage/ investment stage | 65.0 | 27.8 | 4.7 | 2.5 | 74.6 | 19.6 | 4.0 | 1.8 | 0.040 |

This table displays the extent of change in the investment strategies of VC and PE investors. The question asked was: “To what extent does the current geopolitical situation and macroeconomic environment change your investment strategy regarding...?”. We report the results separately for VC and PE investors (Column I or II, respectively) and display the percentages of respondents in the respective categories. Column III displays the results of a statistical test of equality of means between the two types of investors (using the numerical values behind the answer categories)

Table 6 Increase in the importance of specific investment selection criteria

| Investment selection criteria | I VC investors (N = 443) | II PE investors (N = 224) | III | |
|---|--------------------------------|---------------------------------|---------------------------------|----------------|
| | | | Test of equality of proportions | |
| | | | Difference | <i>p</i> value |
| Valuation and deal terms | 62.3% | 48.7% | 13.6% | 0.007 |
| Cash-generating capacity | 41.0% | 42.9% | − 1.9% | 0.744 |
| Profitability/profitability potential | 37.9% | 33.9% | 4.0% | 0.312 |
| Exit potential | 36.8% | 29.5% | 7.3% | 0.060 |
| Revenue-generating capacity | 34.8% | 28.1% | 6.7% | 0.084 |
| Management team | 27.5% | 30.4% | − 2.9% | 0.447 |
| Business model | 25.3% | 29.5% | − 4.2% | 0.249 |
| ESG considerations | 23.5% | 43.8% | − 20.3% | 0.000 |
| Geographical location of target company | 21.7% | 27.7% | − 6.0% | 0.085 |
| Product's value proposition | 19.4% | 28.1% | − 8.7% | 0.011 |
| Industry | 16.5% | 44.6% | − 28.1% | 0.000 |
| Scalability of the business | 16.3% | 21.9% | − 5.6% | 0.075 |
| Past performance/track record | 16.0% | 14.3% | 1.7% | 0.557 |
| Our ability to add value | 14.2% | 23.7% | − 9.5% | 0.002 |
| Diversity and inclusion considerations | 14.2% | 16.5% | − 2.3% | 0.433 |
| Total size of the addressable market | 11.5% | 13.4% | − 1.9% | 0.483 |
| Technology | 10.8% | 26.3% | − 15.5% | 0.000 |
| Venture stage ^a | 10.2% | — | — | — |
| Market leadership ^a | — | 17.9% | — | — |
| Strategic fit in investment portfolio | 10.2% | 12.1% | − 1.9% | 0.457 |
| Referral by other GPs/investors | 8.1% | 2.7% | 5.4% | 0.006 |
| Others | 15.7% | 16.5% | − 0.8% | 0.869 |

The table displays the investment selection criteria with the highest increase in importance for VC and PE investors. The question asked was: “Considering the current geopolitical situation and macroeconomic environment, has the importance of the respective investment selection criteria changed?”. We report the results separately for VC and PE investors (Column I or II, respectively). Column III reports the differences in percentages and the results of a statistical test of equality of proportions between the two types of investors

^aThe investment selection criterion ‘venture stage’ (‘market leadership’) was only included in the VC survey (PE survey)

Table 6 shows the increase in the importance of various investment selection criteria for VC and PE investors as a reaction to the Russian war against Ukraine. The question posed to the participants of the survey was “Considering the current geopolitical situation and macroeconomic environment, has the importance of the respective investment selection criteria changed?”. The respondents rated for each criterion whether the importance became ‘less important’, ‘more important’, or ‘didn’t change’. In the following, we report the results for the ‘more important’ response option.

The top five criteria gaining importance for VC investors were ‘valuation and deal terms’ (62%), ‘cash-generating capacity’ (41%), ‘profitability/profitability potential’ (38%), ‘exit potential’ (37%), and ‘revenue-generating capacity’ (35%). In comparison, the corresponding ranking for PE investors is as follows: ‘valuation and deal terms’

(49%), ‘industry’ (45%), ‘ESG-considerations’ (44%), ‘cash-generating capacity’ (43%), and ‘profitability/profitability potential’ (34%).

While VC and PE investors had similar perceptions regarding some criteria (e.g., ‘cash-generating capacity’, and ‘profitability/profitability potential’), we observed some remarkable differences in other criteria. For example, the ‘industry’ (16% for VC vs. 45% for PE, $p < 0.01$), ‘ESG considerations’ (23% for VC vs. 44% for PE, $p < 0.01$), and ‘technology’ (11% for VC vs. 26% for PE, $p < 0.01$) became comparatively more important as investment selection criteria for PE investors than for VC investors. In turn, the incremental importance attached to ‘valuation and deal terms’ (62% for VC vs. 49% for PE, $p < 0.01$) and ‘revenue-generating capacity’ (35% for VC vs. 28% for PE, $p < 0.10$) was higher for VC than for PE investors.

7 Heterogeneity analyses

We conducted two sets of heterogeneity analyses. The first set concerns gender splits comparing the answers of male (VC: $N = 385$; PE: $N = 189$) and female (VC: $N = 58$; PE: $N = 33$) investors. Prior research suggests that gender differences in investment preferences and performance might in fact exist (Cojoianu et al., 2023; Gompers et al., 2022). We find that while female VC investors tend to be more pessimistic than male investors regarding operational challenges of portfolio companies, they are more optimistic in their assessment of LP’s willingness to invest. We also observed that female VCs tended to have a more positive sentiment compared to their male counterparts on a range of market sentiment indicators such as the development of the fundraising environment and access to finance for their portfolio companies. The situation is different for PE investors, where female investors are overall more pessimistic than male investors regarding fundraising. The second set of heterogeneity analyses compares subsamples of investors from Eastern Europe¹ (VC: $N = 27$; PE: $N = 17$) versus the rest of Europe (VC: $N = 402$; PE: $N = 207$). VC investors from Eastern Europe stress to a higher extent fundraising challenges on the fund level and operational problems on the portfolio firm level. Similarly, PE investors from Eastern Europe report to a stronger extent fundraising challenges, particularly with banks as LPs. Surprisingly, they were more optimistic than investors from the rest of Europe regarding fundraising from government funds.

8 Discussion

8.1 Summary of main results

The Russian war against Ukraine and the associated change in the macroeconomic environment and geopolitical situation affected the European entrepreneurial finance sector. Using information from two surveys conducted with VC and PE fund managers, our study shows how. The perceptions of the fundraising environment were worse than during the COVID-19 crisis. LPs became more risk-averse and less willing to invest. Apart from these

¹ We collected answers from investors with headquarters in Poland, Bulgaria, Czechia, Romania, Slovakia, and Ukraine.

Table 7 Summary of main findings

| | Findings |
|---|---|
| <i>Investor level</i> | |
| Market sentiment | Strong decline for both VC and PE compared to previous years; while the situation in 2022 was still assessed to be positive in many aspects, in particular the expectations deteriorated strongly |
| Fundraising challenges | Both investor types report more risk-aversion of LPs and LPs leaving the market as important challenges resulting in an overall lower willingness of LPs to invest |
| LPs' willingness to invest | Particularly banks, insurance funds, and pension funds have a lower willingness to invest |
| Operational challenges | Main operational challenges are liquidity needs of portfolio companies, increased regulation and, bureaucracy in fund management, and reduced exit and divestment opportunities |
| Change in investment strategy | Investment strategy is changed particularly concerning the 'required experience of the entrepreneur', the 'preferred sector or industry', and the 'geographical focus'. Overall, the changes were more pronounced for PE than for VC investors |
| Change in investment selection criteria | Financial investment selection criteria such as financial valuation, profitability, and cash- as well as revenue-generating capacity, increased in importance. Some significant differences exist differences between VC and PE investors (e.g., with regard to industry, ESG, and technology as criteria) |
| <i>Portfolio company level</i> | |
| Financing-related challenges | Securing equity financing, maintaining liquidity, rising interest rates, and inflation levels were considered the most pressing financing-related challenges for the portfolio companies. The overall level of concern was higher with VC as compared to PE investors |
| Market-related challenges | The most important challenges for the portfolio companies of VC investors were 'customer acquisition' and 'strong product market competition', while the two most important challenges for the portfolio companies of PE investors are 'demand shifts of customers' and 'customer acquisition and retention'. The overall level of concern was higher with VC as compared to PE investors |
| Operational challenges | The top three operational challenges for the portfolio companies of VC investors were 'shortage of skilled labor', 'rising labor costs', and 'supply chain disruptions'. The respective list for portfolio companies of PE investors was 'rising energy costs', 'rising labor costs', and 'supply chain disruptions'. The overall level of concern was higher with PE as compared to VC investors |
| <i>Heterogeneity analyses</i> | |
| Sample split by gender | Female VC investors were more pessimistic than male investors regarding operational challenges of portfolio companies; yet, they were more optimistic in their assessment of LP's willingness to invest. With PE investors, female investors were more pessimistic than male investors regarding fundraising |
| Sample split by geography | Investors from Eastern Europe (both VC and PE) assess the fundraising situation more pessimistic than their counterparts from the rest of Europe |

fundraising issues, a significant number of operational challenges on the fund and portfolio level were reported. Overall, the situation seemed to be more difficult for the VC than the PE sector. For VC portfolio companies, the financing- and liquidity-related issues seemed to be of a more existential and survival-threatening nature, which also negatively affected the VC investors themselves. In response to these challenges, both VC and PE investors altered their investment strategy regarding preferred industries and placed greater emphasis on the profitability and cash-/revenue-generating capacity of their portfolio companies. Heterogeneity analyses show that gender differences with investors exist and that investors from Eastern Europe assess the fundraising situation more pessimistic than their counterparts from the rest of Europe. Table 7 below summarizes our main findings.

8.2 Limitations

Of course, the results of our two surveys should be interpreted with great caution. First, the survey responses are a snapshot and reflect the economic and political situation in the summer of 2022.² Second, although we used formulations linking our findings to the Russian war against Ukraine, it is not possible to claim any causality. The effects we observed might have also occurred without the war and it is hard to separate them from other effects occurring simultaneously related to the geopolitical situation and macroeconomic environment, particularly rising inflation levels and interest rates. Another limitation concerns our strong focus on entrepreneurial finance investors located in Europe (see Table 10 in the appendix for the locations of the headquarters of the investors that took part in our survey), which deprives us of the possibility to make comparisons between European, Asian and US entrepreneurial investors. This way, we are not able to compare the effects of the war on the European entrepreneurial finance sector with those on the worldwide market of entrepreneurial finance. Finally, as our study is the first one of its kind, we could not rely on established questionnaires, scales, and items to measure the impact of an exogenous event on entrepreneurial finance. Using established scales would certainly increase the internal validity of our research and would facilitate comparisons with prior and future research on the effects of exogenous crisis events on entrepreneurial finance.

8.3 Comparison to earlier crises and short- versus long-term effects

How do the current crisis and its associated challenges and investor reaction compare to the situation of earlier crises, in particular, the dot-com crisis in the late 1990s and early 2000s (Alperovych et al., 2015; de Vries & Block, 2011) and the 2008–2009 global financial crisis (Block & Sandner, 2009; Conti et al., 2019)? The reasons for the current crisis are different—they are more exogenous and not driven by an overvaluation of technology, market saturation, and herding behaviors of other market participants. It is the invasion of Russia into Ukraine and the change in the macroeconomic environment that led to the current crisis.

It is probably too early to make predictions about what this implies for the recovery and the long-term prospects of the entrepreneurial finance sector. Unlike in earlier crises, however, it could lead to a more fundamental shift in preferred industries and geographies,

² We would also like to refer to market developments since summer 2022, which show that the European VC and PE market activity continued to cool down substantially, corroborating the survey findings.

and therefore change investment strategies and preferences more profoundly. For example, although at the beginning of the COVID-19 crisis it looked as if we would experience a doomsday scenario, the VC and PE markets proved resilient, recovered quickly from the first shock of the pandemic and showed no signs of 'long COVID'. To the contrary, these markets were able to identify the opportunities and even finally (at least partially) benefit from the crisis (e.g., by supporting companies providing innovative solutions in the areas of healthcare and biotech). However, in the aftermath of the war in Ukraine, the expectations of the surveyed fund managers were at record lows for many of the market sentiment indicators, even when compared to those during the COVID crisis. In addition, further survey findings, such as the greater risk-aversion of LPs and their lower willingness to invest into the asset class, hint towards structural issues which could be interpreted as patterns and risks of a more longer-term nature. The sudden halt and resumption in demand following the COVID-19 confinement measures resulted in significant supply chain issues, igniting, in turn, a rising trend in import and producer prices, inflation as well as inflation expectations. These were further fuelled by the surge in energy prices in the aftermath of the war in Ukraine. There are signs that the European VC and PE market activity cooled down even more substantially since summer the of 2022. For example, according to recent PitchBook reports, VC fundraising increased at a slower pace in 2022, compared to the year before, and PE fundraising dropped significantly. At the same time, new PE investments stabilised, but VC investments into young innovative companies declined. Negative growth rates were reported for the exits of PE/VC-backed portfolio companies. Moreover, in the first months of 2023, market activity has not started to pick up again (PitchBook, 2023a, 2023b).

It is unclear to what extent the effects of the current crisis are limited to Europe and how it affects entrepreneurial finance outside Europe. In their annual monitor produced together with PitchBook and published in Q4 2022, the US National Venture Capital Association (NVCA) states that "while 2022 marks an all-time high for VC fundraising and record amounts of dry powder [...] there is anxiety in the market, and current players are reinforcing their positions against the possibility of a tighter monetary environment" (NVCA and PitchBook, 2022, p. 3). Over the year, the number of VC deals dropped sharply between the first and the last quarter. It remains to be seen whether this sharp decline is just the "afterparty effect of 2021 wearing off" (NVCA and PitchBook, 2022, p. 3) or is more fundamental and long-term in nature. If the Russian war against Ukraine changes the character of globalization and multilateralism as we have seen it over the last decades, then this will certainly not only affect entrepreneurial finance in Europe but will have a worldwide impact.

8.4 Practical implications and policy responses

The future and prospects of the sector are related to (European) policy responses. EU and member state policies that aim to make Europe more resilient and independent regarding energy and key enabling technologies, for example, can lead to restrictions but also new opportunities for start-ups and high-growth firms with effects for entrepreneurial finance investors and their LPs. For example, since COVID-19 and accelerated by the Russian war against Ukraine, subsidies by member states for certain sectors such as chip manufacturing, hydrogen production, battery production for electric vehicles, and the solar industry are at a record high. This has direct and indirect effects for the entrepreneurial finance sector and their portfolio companies. They may be direct beneficiaries of such subsidies with impacts

on the business cases and development of selected portfolio companies. The impact will be particularly large for portfolio companies with a link to the defence or energy sector. Yet, such massive subsidies need to be financed, which can lead to increased taxes or government debt. Both has implications for the entrepreneurial finance ecosystem. Entrepreneurial finance investors may increasingly also face restrictions when it comes to finding (lucrative) exit opportunities. For technologies and portfolio ventures of high strategic and geopolitical importance, the pool of candidates for a trade sale may reduce strongly as investors from China or other Russia-friendly countries are no longer accepted by policymakers and society at large. As these illustrative examples show, the business and practice of entrepreneurial finance may have tuned into a more politically sensitive business where it matters who is behind a particular transaction and acquires strategically important assets or technologies.

9 Agenda for further research

Several research avenues exist to analyze the short- and long-term effects of the Russian war against Ukraine on entrepreneurial finance. We present a short agenda for future research.

9.1 Use of archival data to discover long-term effects

While our study is based on a survey of VC and PE investors and can be considered a snapshot of the economic and political situation in (early) summer 2022, future research might use objective archival data from PitchBook, Crunchbase, and other financial databases to assess the long-term impacts of the Russian war against Ukraine on entrepreneurial finance. Future research can explore how fundamental and long-term the changes described in our study are and what this means for entrepreneurship in the affected countries, particularly in Ukraine, Russia, and the Baltic States. To what extent is the war associated with fundamental and long-term shifts in industry, technology and country preferences of entrepreneurial finance investors? Which industries, technologies, and/or countries become more attractive, and which ones do not? How much is venture valuation affected and how much of this effect can be attributed to the war and how much is due to an increase in inflation and interest rates? Prior research on the global financial crisis has shown that the financial crisis is associated with a 20% decrease in the average amount of funds raised per funding round (Block & Sandner, 2009). Finally, data from financial databases would allow us to investigate the war-related effects on fund and portfolio firm performance of different types of VC or PE investors (e.g., Braun et al., 2017; Haslanger et al., 2022). Related to this, one could investigate which portfolio selection strategy is best or most resilient in a situation of high geopolitical uncertainty.

9.2 Differences in the effects across financing instruments and actors

The use of such archival databases would also allow us to investigate the impacts of the Russian war against Ukraine on debt-providing entrepreneurial finance investors such as venture debt (De Rassenfosse & Fischer, 2016) or debt funds (Block et al., 2024). The impact may be more severe as these instruments compete against bank loans and their interest rates. Also, it would be interesting to analyze the effects of the war on early-stage

investors or financing tools such as business angel funding (Mason & Botelho, 2021) or (equity) crowdfunding (Chandler et al., 2021). As such financing instruments are less dependent on LP funding from financial institutions, one could expect the effect of the war to be lower. Nevertheless, a typical exit channel of a business angel is a VC investor (Capizzi et al., 2022), which could lead to an indirect cascade or trickle-down effect. Prior research on COVID-19 suggests that early-stage financing can be hit particularly hard in a situation of an exogenous shock (Brown & Rocha, 2020). For crowdfunding, one could also argue that it is more inclusive compared to traditional sources of entrepreneurial financing (Butticè & Vismara, 2022), and therefore the reaction towards an exogenous crisis might be different. Finally, as early-stage entrepreneurs may struggle to obtain money from business angels, they may increasingly turn to bootstrapping behavior (Grichnik et al., 2014; Vanacker et al., 2011) as an alternative way of financing their early-stage entrepreneurial activities. Prior research by Block et al. (2021) shows that many entrepreneurs have successfully used bootstrapping techniques as a tool to survive the business restrictions introduced during COVID 19. It remains to be seen whether bootstrapping can also compensate to some extent for the financing gaps associated with the Russian war against Ukraine. To identify bootstrapping behavior, one could analyze the balance sheets of entrepreneurial ventures and look for signs of an increased use of trade credits and/or credit card or bank account overdrafts.

9.3 Effects on PE and VC contracting

To reduce information uncertainty and moral hazard resulting from principal-agent problems VC and PE investors but also LPs turn to sophisticated contracting (Fu et al., 2022; Kaplan & Strömberg, 2003). Given the increase in geopolitical uncertainty and the increasing importance of geopolitical factors, VC and PE contracting may have changed as well. Hence, to what extent are geopolitical issues and associated restrictions now an integral part of VC or PE contracts, for example about exit channels, technology in- or out-licensing, or venture internationalization? When included, how are such geopolitical contract clauses enforced? What is the role of reporting or monitoring in this regard? How does the inclusion or enforcement of such political contract clauses differ by investor type (e.g., governmental versus private) or type of LP? Such research will be difficult to conduct through quantitative empirical research but will likely be carried out using qualitative research methods.

9.4 Effects on VC syndication networks

Prior research has investigated the composition and effects of VC syndicates and VC syndication networks (e.g., Hochberg et al., 2007). The choice of a syndication partner and the composition of a VC funding syndicate has been explained from a financial, networking, and resource-based/value-added perspective (e.g., De Vries & Block, 2011; Dimov & Milanov, 2010; Hopp & Lukas, 2014; Manigart et al., 2006; Sorenson & Stuart, 2001). A consequence of the Russian war against Ukraine could be that political factors and the country of residence or origin of the syndication partner play increasingly important roles. Hence, it would be interesting to analyze whether the composition of VC funding syndicates and the syndication networks of VCs has changed as a result of the Russian war against Ukraine.

9.5 Effects on the market for IPOs and trade sales

Prior research shows that wars can have significant negative impacts on equity markets (Choudhry, 2010; Hudson & Urquhart, 2015). Not surprisingly, such an effect was also found for the Russian war against Ukraine. The effects were particularly strong for European and Asian countries (Yousaf et al., 2022) and firms from the energy sector (Umar et al., 2022). Lower equity prices also reduce the attractiveness of IPOs, which in turn makes it more difficult for VC and PE investors to successfully exit from their investments. The market for trade sales may also be affected by the war and corporate acquirers from specific countries may no longer be welcomed. Future research could analyze how the Russian war against Ukraine changed the exit opportunities of VC and PE investors and how such a change can be attributed to changes in the market for IPOs and trade sales.

9.6 Disruptions in entrepreneurial finance and impacts on entrepreneurship

Next to the impact of the war on the market for entrepreneurial finance, it is also important to consider the direct and indirect effects of the war on early- and later-stage entrepreneurship and innovation in Europe. The Russian war against Ukraine did not only affect the supply of funds and the valuation of portfolio companies but also impacted the entrepreneurial opportunities as such and the associated production and supply chain processes. Future research could try to disentangle how much of the effect of the war on early- and later-stage entrepreneurship and innovation can be attributed to disruptions in the market for entrepreneurial finance. Such an analysis could take place on regional and country levels.

9.7 Effects on cleantech investments of PE and VC firms

Another important question is to what extent the Russian war against Ukraine impacts cleantech investments of PE and VC firms in Europe—both in the long and short term. The answer is not clear. On the one hand, the study by Hofman and Huisman (2012) mentioned in the literature section above showed a negative effect of an unexpected exogenous event such as the financial crisis on the popularity of environmental policies and VC investments into cleantech. On the other hand, as the Russian war against Ukraine has had a fundamental impact on the oil and gas supply in Europe, the war may actually trigger VC and PE cleantech investments into the renewable energy sector in Europe. Future research will show what effect dominates.

9.8 Primacy of politics over economics and effects of policy initiatives

The Russian war against Ukraine led to a primacy of politics over economics and hence entrepreneurship, technology and innovation policy (Basilico et al., 2023; Gokhberg et al., 2022) play an increasingly important role in how entrepreneurship and innovation unfolds and develops. In this respect, how did the war change the expectations of policy-makers and the society at large towards entrepreneurial finance investors and entrepreneurship?

To what extent do the goals of entrepreneurial finance investors and entrepreneurs reflect these expectations? Which policy responses can mitigate the consequences of the war on entrepreneurial finance and entrepreneurship? What is the role of monetary policy, if any (Bellavitis et al., 2023)? Many of these research questions are interdisciplinary and located at the intersection of entrepreneurship with finance, public policy, conflict studies and economic geography. Entrepreneurship research in this area thus offers the potential to contribute beyond the field of entrepreneurship to neighbouring fields and disciplines (Thurik et al., 2023).

Appendix

See Tables 8, 9, 10, 11 and 12.

Table 8 Respondents' characteristics

| Respondents' characteristics | VC investors (N = 443) | | PE investors (N = 224) | |
|---|------------------------|------|------------------------|------|
| | N | % | N | % |
| <i>Gender</i> | | | | |
| Male | 385 | 86.9 | 189 | 84.4 |
| Female | 58 | 13.1 | 33 | 14.7 |
| Non-binary/prefer not to say | 0 | 0 | 2 | 0.9 |
| <i>Age (years)</i> | | | | |
| 18–24 | 3 | 0.7 | 0 | 0 |
| 25–34 | 31 | 7.0 | 5 | 2.2 |
| 35–44 | 91 | 20.5 | 32 | 14.3 |
| 45–54 | 197 | 44.5 | 108 | 48.2 |
| 55–64 | 93 | 21.0 | 70 | 31.3 |
| 65 or older | 25 | 5.6 | 9 | 4.0 |
| Prefer not to say | 3 | 0.7 | 0 | 0 |
| | Mean | SD | Mean | SD |
| Experience as VC/PE fund manager (in years) | 13.1 | 8.4 | 18.2 | 7.9 |

This table displays some human capital characteristics of the survey respondents. We report the results separately for VC and PE investors

Table 9 Firm characteristics of VC and PE investors

| Firm characteristics | VC investors (N=443) | | | PE investors (N=224) | | |
|---|----------------------|-------|--------|----------------------|-------|--------|
| | N | | % | N | | % |
| <i>Assets under management (in million EUR)</i> | | | | | | |
| < 50 | 99 | | 22.3 | 24 | | 10.7 |
| 50–99 | 78 | | 17.6 | 17 | | 7.6 |
| 100–199 | 93 | | 21.0 | 58 | | 25.9 |
| 200–499 | 93 | | 21.0 | 70 | | 31.3 |
| 500–999 | 41 | | 9.3 | 22 | | 9.8 |
| ≥ 1000 | 39 | | 8.8 | 33 | | 14.8 |
| <i>Investment stage</i> | | | | | | |
| Pre-seed stage | 73 | | 16.5 | 0 | | 0 |
| Seed stage | 148 | | 33.4 | 1 | | 0.4 |
| Early stage | 157 | | 35.4 | 1 | | 0.4 |
| Later stage | 65 | | 14.7 | 5 | | 2.2 |
| Growth capital | – | | – | 71 | | 31.7 |
| Buyout | – | | – | 142 | | 63.4 |
| Rescue/turnaround | – | | – | 4 | | 1.8 |
| | Mean | SD | Median | Mean | SD | Median |
| Firm age (in years) | 13 | 8.6 | 11 | 15 | 8.5 | 14 |
| Latest VC fund size/PE fund size (in million EUR) | 138.1 | 255.8 | 76.0 | 227.4 | 328.1 | 150.0 |
| Funds raised to date (absolute number) | 3.8 | 6.9 | 3.0 | 3.6 | 3.1 | 3.0 |

This table displays selected firm characteristics, as indicated by the survey respondents. We report the results separately for VC and PE investors

Table 10 Headquarter location of VC and PE investors

| Headquarter location | VC investors (N = 443) | | PE investors (N = 224) | |
|----------------------|------------------------|------|------------------------|------|
| | N | % | N | % |
| Germany | 58 | 13.1 | 21 | 9.4 |
| UK | 44 | 9.9 | 21 | 9.4 |
| Netherlands | 43 | 9.7 | 16 | 7.1 |
| France | 35 | 7.9 | 33 | 14.7 |
| Spain | 29 | 6.5 | 16 | 7.1 |
| Switzerland | 21 | 4.7 | 7 | 3.1 |
| Italy | 17 | 3.8 | 27 | 12.1 |
| Finland | 16 | 3.6 | 8 | 3.6 |
| Sweden | 16 | 3.6 | 10 | 4.5 |
| Belgium | 15 | 3.4 | 8 | 3.6 |
| Portugal | 15 | 3.4 | 11 | 4.9 |
| Denmark | 13 | 2.9 | 4 | 1.8 |
| Norway | 11 | 2.5 | 1 | 0.4 |
| Poland | 11 | 2.5 | 0 | 0 |
| Czechia | 9 | 2.0 | 0 | 0 |
| Greece | 9 | 2.0 | 3 | 1.3 |
| Ireland | 9 | 2.0 | 4 | 1.8 |
| Austria | 8 | 1.8 | 1 | 0.4 |
| United States | 8 | 1.8 | 1 | 0.4 |
| Bulgaria | 7 | 1.6 | 3 | 1.3 |
| Luxembourg | 7 | 1.6 | 0 | 0 |
| Estonia | 6 | 1.4 | 3 | 1.3 |
| Israel | 6 | 1.4 | 0 | 0 |
| Turkey | 5 | 1.1 | 2 | 0.9 |
| Croatia | 4 | 0.9 | 3 | 1.3 |
| Hungary | 4 | 0.9 | 1 | 0.4 |
| Lithuania | 4 | 0.9 | 0 | 0 |
| Iceland | 3 | 0.7 | 0 | 0 |
| Cyprus | 2 | 0.5 | 0 | 0 |
| Latvia | 1 | 0.2 | 0 | 0 |
| Lichtenstein | 1 | 0.2 | 0 | 0 |
| Singapore | 1 | 0.2 | 0 | 0 |
| Ukraine | 1 | 0.2 | 1 | 0.4 |
| Romania | 0 | 0 | 1 | 0.4 |
| Slovakia | 0 | 0 | 1 | 0.4 |
| Other | 1 | 0.2 | 0 | 0 |

This table displays the headquarter locations of the respondents' respective VC and PE firms. Firms headquartered outside Europe were still included in the sample as long as they had an office in Europe and were active in the European PE/VC market

Table 11 Industry focus of VC and PE investors

| Sector or industry | VC investors (N = 443) | | PE investors (N = 224) | |
|----------------------------------|---------------------------|------|---------------------------|------|
| | N | % | N | % |
| ICT | 136 | 30.7 | 19 | 8.5 |
| Biotech and healthcare | 90 | 20.3 | 28 | 12.5 |
| Energy and environment | 55 | 12.4 | 7 | 3.1 |
| Business services | 41 | 9.3 | 59 | 26.3 |
| Business products | 32 | 7.2 | 40 | 17.9 |
| Financial and insurance services | 27 | 6.1 | 2 | 0.9 |
| Chemicals and materials | 10 | 2.3 | 1 | 0.4 |
| Consumer services | 9 | 2.0 | 7 | 3.1 |
| Consumer goods | 7 | 1.6 | 18 | 8.0 |
| No clear sector focus | 36 | 8.1 | 43 | 19.2 |

This table displays the most important industries or sectors, in which VC and PE investors invest, as indicated by the survey respondents

Table 12 Most important investment selection criteria

| Investment selection criteria | I VC investors (N = 443) | II PE investors (N = 224) | III | |
|---|--------------------------------|---------------------------------|---------------------------------|---------|
| | | | Test of equality of proportions | |
| | | | Difference | p value |
| Management team | 69.3% | 54.0% | 15.3% | 0.001 |
| Scalability of the business | 29.0% | 19.2% | 9.8% | 0.005 |
| Technology | 27.5% | 2.7% | 24.8% | 0.000 |
| Total size of addressable market | 24.6% | 3.1% | 21.5% | 0.000 |
| Product's value proposition | 23.9% | 14.7% | 9.2% | 0.006 |
| Exit potential | 20.3% | 13.8% | 6.5% | 0.04 |
| Business model | 14.7% | 28.1% | − 13.4% | 0.000 |
| Venture stage ^a | 10.2% | n.a | – | – |
| Market leadership ^a | – | 8.9% | – | – |
| Geographical location of target company | 9.7% | 9.8% | − 0.1% | 0.960 |
| Revenue-generating capacity/potential | 9.3% | 13.4% | − 4.1% | 0.102 |
| Valuation and deal terms | 8.6% | 15.6% | − 7.0% | 0.006 |
| Strategic fit in investment portfolio | 8.6% | 5.8% | 2.8% | 0.203 |
| ESG considerations | 8.4% | 9.4% | − 1.0% | 0.658 |
| Industry | 7.9% | 12.1% | − 4.2% | 0.081 |
| Our ability to add value | 7.2% | 22.8% | − 15.4% | 0.000 |
| Profitability/profitability potential | 6.3% | 30.4% | − 24.1% | 0.000 |
| Past performance/track record | 6.1% | 11.6% | − 5.5% | 0.013 |
| Cash-generating capacity/potential | 2.7% | 18.3% | − 15.6% | 0.000 |
| Other/s | 1.6% | 0.9% | 0.7% | 0.468 |
| Diversity and inclusion considerations | 1.1% | 3.1% | − 2.0% | 0.067 |
| Referral by other GPs/investors | 1.1% | 0.0% | 1.1% | 0.111 |

This table displays the most important investment selection criteria for VC and PE investors. The question asked was: “*Considering your firm's overall activity in the venture capital/private equity market, what are your most important investment selection criteria?*”. We report the results separately for VC and PE investors (Column I or II, respectively). The respondents were allowed to select multiple response options; hence, we report the respective percentages relatively to the total number of respondents for each investor type, while the reported figures reflect the percentage of respondents who have selected each item among their three most important investment selection criteria. Column III shows the differences in percentages and the results of a statistical test of equality of proportions between the two types of investors

^aThe investment selection criterion ‘venture stage’ (‘market leadership’) was only included in the VC survey (PE survey)

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