THESIS ON ECONOMICS AND BUSINESS ADMINISTRATION H57

Cyclicality, Corporate Investments and Financial Soundness: Evidence from Central and Eastern European Countries

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TTÜ PRESS

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Declaration:

Hereby I declare that this doctoral thesis, my original investigation and achievement, submitted for the doctoral degree at Tallinn University of Technology has not been submitted for any other academic degree.

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LIST OF PUBLICATIONS

Paper I: Maripuu, P. and Männasoo, K., 2014. Financial distress and cycle-sensitive corporate investments. *Baltic Journal of Economics*, Vol. 14, pp. 181-193. DOI: http://dx.doi.org/10.1080/1406099X.2014.999481

Paper II: Männasoo, K. and Maripuu, P., 2015. Company Performance, Investment Decision, and Cyclical Sensitivity: A Dynamic Estimation on Company Microdata. *Eastern European Economics*, Vol. 53, pp. 1-14.
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Author's Contribution to the Publications:

Paper I – The author of the thesis had a leading role in preparing the data-set, reviewing the literature and running the estimations. The author of the thesis co-wrote the analysis and results sections and acted as the corresponding author in the publishing process.

Paper II – The author of the thesis had a leading role in preparing the data-set and reviewing the literature. The author of the thesis co-wrote the analysis and results sections, and was involved in the econometric estimations and in drawing the research conclusions.

Paper III – The author of the thesis was involved in setting the outline of the paper structure, reviewing the literature, preparing the data-set and data description, and running the econometric estimations. The author of the thesis acted as the corresponding author in the publishing process.

INTRODUCTION

Increasing global competition and sustaining growth demand corporate investment in replacing existing assets and technologies and acquiring new ones that can enhance productivity. However, there are significant financial risks associated with investment in improving company financial soundness, especially during the initial set up of a company and during economic fluctuations. Whether companies can achieve their ambitions for productivity and growth depends on the type, volume and timing of the investment they make, and on concomitant financing choices. The investment and financing choices are eventually crucial for maintaining company survival.

At the macro level, corporate investment supports economic growth, and tends to create jobs and generate value added and tax revenues. On the downside, excessive cycle-driven investment during economic booms may lead to inefficient allocation of resources and could lead particular industries in the economy to overheat. In the aftermath of economic and financial crises, over-cautiousness and prevailing uncertainties prevent companies from making investments and slow the recovery, with the result that opportunities for businesses to grow are lost.

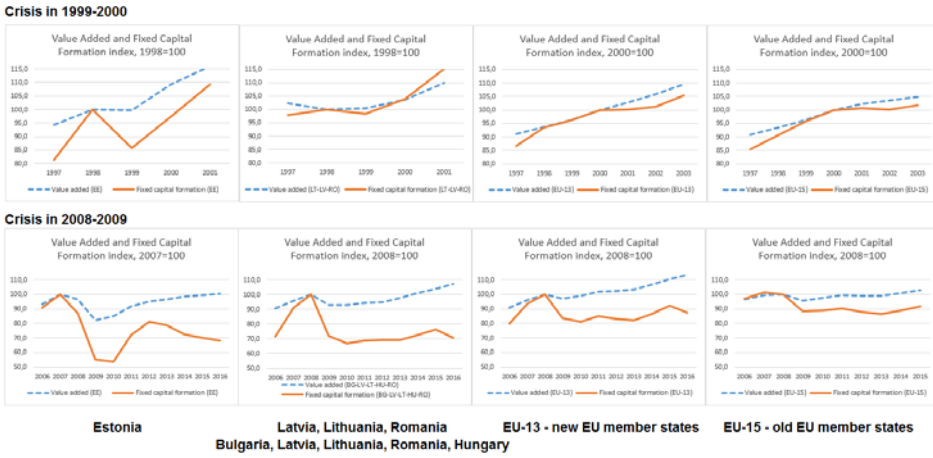

Figure 1. Gross Value Added and Gross Capital Formation in the EU and CEE in the 1999-2000 and 2008-2009 crises

Data source: Eurostat (Data table nama_10_gdp)

Figure 1 illustrates the dynamics of gross value added by the real sector and gross capital formation from the comparative perspective of Estonia and selected countries from Central and Eastern Europe (CEE), namely Latvia, Lithuania, Romania, Bulgaria and Hungary; the entire EU-13 of "new" European Union (EU) member states, which are mostly from CEE; and the EU-15 of "old" EU member states during the last two crises in 1998-2000 and 2008-2010. Real value added and gross capital formation both saw a strong slump in the crisis years during both crisis episodes. While the real value added started to recover after

both crises, the level of gross capital formation remained low for a prolonged period. This observation is worrisome and it casts doubts on the rapid economic revivals after the crises and indicates that crises, especially the recent crisis, may have a strong and persistent negative effect on economies.

This thesis builds on three publications that provide new micro-level empirical evidence on the linkages between cyclicality, corporate investments, and the financial soundness of companies (see Table 1 below). The line of research pursued in them contributes by addressing the issue of investment cyclicality from the company perspective. The main aim of this is to look for how a company's investment-financing decisions impact its financial soundness. In doing this, the investigation accounts for investment patterns like those in the timing, type and intensity of investment and for the financing patterns in investment gearing. The confounding cyclicality effect is one of key elements running through all three publications and it has been researched in the context of the 2008-2009 global financial crisis, but in Papers I and II the Estonian dataset is also considered in the context of the 1997-1998 Russian and Asian financial crisis.

Overall, the research of the thesis project has made use of two different data sources: (1) Estonian Business Registry data from 1995-2010 and (2) Business Environment and Enterprise Performance Survey round IV data in conjunction with the Financial Crisis Survey 2009-2010. The empirical analysis conducts tests on several hypotheses concerning the relationship between cyclical investment-financing decisions and the financial standing of companies. In doing so, the thesis contributes to improving the understanding of the implications of companies' investment and financing decisions conditional on the cyclical economic environment for the financial outlook and financial soundness of those companies.

The first research paper, Maripuu and Männasoo (2014) employs Estonian Company Registry data from 1995-2010 and shows that the timing, intensity, industry and type of investments all have a significant effect upon the probability of a company failing to meet the minimum capital requirements set by law.

The second research paper, Männasoo and Maripuu (2015), estimates a dynamic Generalised Method of Moments (GMM) model on a panel of about 20 thousand Estonian companies over 1996-2010 and finds that companies which borrowed before the crisis maintained stronger financial standing in the subsequent period. Long-term investments improved companies' financial outlook, but only if they were committed before the economic upturn. An opposite, negative, effect was observed if long-term investments were made before the crisis and downturn. No similar pattern emerged for short-term investments. The results of the study stress the cycle-sensitivity of long-term investments and the significant financial implications stemming from them.

The third paper, Männasoo, Maripuu and Hazak (2017), employs the survey data from the Business Environment and Enterprise Performance Survey (round IV) and from the subsequent Financial Crisis Survey (2009-2010), both conducted jointly by EBRD and The World Bank. The dataset covers company data from five Central and Eastern European countries: Hungary, Bulgaria, Romania, Latvia and Lithuania. The instrumental probit (IV-Probit) model estimates a substantial

adverse impact from investment intensity and debt financing on the financial soundness of companies during the crisis years in 2009-2010. The study reveals considerable non-linearities in how the investment-financing nexus affects the probability of financial distress and company financial soundness.

Table 1. Overview of the papers included in the thesis

Paper	Type of investment addressed	Cyclical effect addressed	Dependent variable	Control variables	Data and econometric method
Paper I	Long and short term investments	Downturn, upturn	Financial distress	Age, size, stock index change, type of company, liquidity buffer, equity buffer, industry	Estonia 1996-2010 Logit
Paper II	Long and short term investments, leverage	Downturn, crisis, upturn	Financial strength	Sales growth, industry	Estonia 1996-2010 GMM
Paper III	Investment intensity, leverage	Crisis	Insolvency/ financial distress	Age, size, employees' university degree, industry, industry value added, private credit to GDP	BG, LV, LT, HU, RO 2007-2010 IV-Probit

The main part of the thesis is structured as follows. In Section 1 a summary overview of the key related literature is provided. Key results of the publications together with conceptual generalisation are presented in Section 2. Section 3 concludes. Appendices 1 to 3 comprise reprints of Papers I, II and III.

1. LITERATURE REVIEW

The extant theoretical and empirical literature has thoroughly investigated the linkages between investment by companies and their financing decisions. There is a substantial body of literature on financial distress and its micro-level and macro-level causes and determinants. In broad terms, the evolution of that literature divides into three streams:

- First came the early studies on predicting firm bankruptcy from balance sheet variables and financial ratios;
- Second was the line of literature which emerged in late 1980s and early 1990s and stressed the macroeconomic and cyclical implications for company distress and financial soundness along with the literature on credit constraints; and
- Third comes the more recent literature, which incorporates the modern advances in empirical methods in its investigation of the endogenous relationships between company investment and financing decisions taken together with macroeconomic cyclical effects and conditioned on the past performance of companies.

While the drivers of company financial soundness and financial strength have been the subject of significant past research interest, the triangular linkages between macroeconomic fluctuations, investment decisions by companies and those companies' financial soundness have still received insufficient attention in the literature.

1.1. Early literature on company failure and bankruptcy prediction

The early contributions in the literature date back to the 1960s, when the empirical line of research into predicting firm bankruptcy first appeared with the pioneering papers by Beaver (1966) and Altman (1968). Beaver's (1966) cash flow model of company distress and Altman's (1968) seminal paper on corporate bankruptcy introduced statistical models to the field. Soon after that, Johnson (1970) suggested that economic conditions may play a role, and so investment-related variables were included in the studies (see e.g. Gentry et al. 1985a and Aziz et al. 1988).

The early theoretical contribution, Beaver's (1966) cash flow model, views the firm as a reservoir of buffers supplied by inflows and drained by outflows. Financial distress, defined as a company's bankruptcy event, was deemed to take place when the buffers have become depleted (see Figure 2 below). Taffler (1983) augmented the cash flow model by stressing that volatility in cash flows elevates the risk of company failure. Laitinen (2011) and Aziz and Dar (2006) have provided comprehensive literature reviews on conceptual advances in company bankruptcy and failure issues, including the gambler's ruin theory by Wilcox

(1971); the income finance theory by Laitinen (1991); the option and credit risk theories by Hillegeist et al (2004); and the coalition behaviour theory by White (1980).

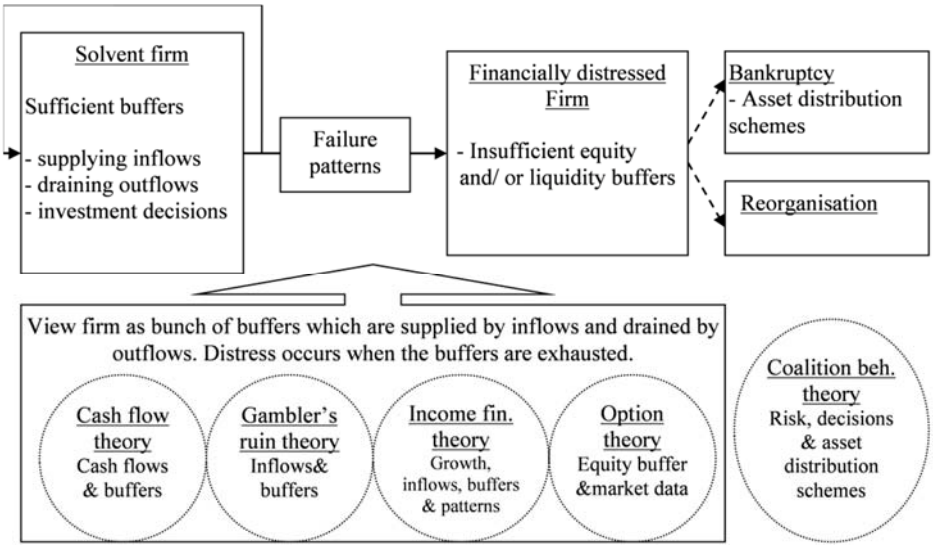

Figure 2. Some common aspects of financial distress theories
Author's illustration based on financial distress theories

The coalition behaviour theory by White (1980) and cash flow theory (see Gentry et al., 1985a, Aziz et al., 1988, Aziz and Lawson, 1989) both account directly for the impact of investment decisions upon a company's financial standing and probability of distress and thus provide important theoretical foundations for the research for this thesis.

The underlying theoretical foundations of Paper I in this thesis are in the cash flow theory of Beaver (1966) and Taffler (1983), which shows that cyclical economic fluctuations put a strain on companies' liquidity reserves and lead to higher cash-flow volatility, which has implications for the financial standing and financial soundness of companies. In line with the cash flow theory and like the early empirical contributions (see e.g. Altman, 1968; Altman et al., 2014; Bellovary, 2007), the results for Paper I find profitability variables to be a proxy for inflows and outflows and a company's liquidity/equity buffer variables to have a significant relationship with its financial standing. The higher the liquidity inflows from current earnings and the stronger the equity buffers, the smaller the risk of financial distress is.

Early empirical studies, however, failed to account for the complex endogenous effects between a company's investment and financing decisions and its financial standing or financial strength, and so they provided highly mixed results for how higher capital investments affected the financial distress of companies. Some researchers reported a positive relationship (e.g. Gentry et al.,

1985a; Aziz et al., 1988; or Aziz and Lawson, 1989), while others found no support for that (Gentry et al., 1985b; McKee and Lensberg, 2002; or Min and Lee, 2005).

In line with the volatility-augmented cash flow theory of Tafler (1983), the empirical results have corroborated the significance of the effect of cyclical volatilities on company financial distress (see e.g. Richardson et al., 1998; Tirapat and Nittayagasetwat, 1999; Liou, 2007; or Männasoo, 2007, 2008). Moreover, Richardson et al. (1998), have highlighted how maintaining internal cash-flow during a recession reduces the perils of financial distress.

There is no single, agreed definition of company failure or financial distress. The literature survey by Balcaen and Ooghe (2006) notes two common approaches that use either the legal definition of bankruptcy or a somewhat broader definition of financial distress. This second definition comes in many flavours, but arguably captures the real failure event better than the legal definition of bankruptcy. The seminal study by Altman (1968) defined the famous Z-score as a continuous measure reflecting the probability of a company going bankrupt and various versions of Altman's Z-score have emerged for different markets and industries. At the other end of the continuum is the concept of distance-to-default originally proposed by Black and Scholes (1973), which is commonly used for listed companies and especially for assessing bank fragility (see Bongini et al., 2002, Gropp et al., 2006, Chan-Lau et al., 2004 and Chen et al., 2006, among others). As a simplified alternative for non-listed companies, Laeven and Levine (2009) propose a Z-score which measures the distance to insolvency by a ratio of returns and the equity buffer to the volatility of returns seen in cash flows. Männasoo (2007, 2008) defined financial distress as a breach of the obligatory minimum equity level set by law. Platt and Platt (2002) proposed three definitions: (1) several years of negative net operating income, (2) suspension of dividend payments, and (3) major restructuring or layoffs, and they employed a combination of these three. Kahya and Theodossiou (1999) employed debt default criteria. The term financial soundness, initially employed in macroprudential literature (Crockett, 2000; Borio, 2003) and policy analysis (IMF, 2001), has recently been used in company level contexts as a measure of distance to insolvency (e.g. Atkeson et. al., 2017, Mizan and Hossain, 2014, Damijan, 2014) and company financial strength (see e.g. Horta et al., 2012).

Company financial soundness studies can generally be divided by their dependent variable into either financial distress studies or financial strength studies. The research in this thesis focused on both of these aspects of company financial soundness and the financial distress concept is employed in Papers I and III and the financial strength concept in Paper II.

In Paper I the obligatory minimum equity requirement set by law was used. This definition was chosen because the interest was in a form of financial distress that is better observable and not dependent on legal procedures, and that has a broader influence on the economy than the ultimate event of bankruptcy. Such a financial distress variable has serious implications for the value of shareholders'

equity and this measure is observed across the whole population of Estonian companies.

Paper II employs a similar approach to Laeven and Levine (2009) and defines a number of financial strength measures, or a Z-score, based on the ratio of the buffer formed by cash inflows and equity to the volatility in this buffer.

Paper III considers the company to be financially distressed if (1) it had filed for insolvency or bankruptcy, or (2) in the last 12 months it had experienced at least two of (2.1) overdue debt to financial institutions, (2.2) debt overdue by more than 90 days to trade creditors, or (2.3) a restructuring of any outstanding liabilities.

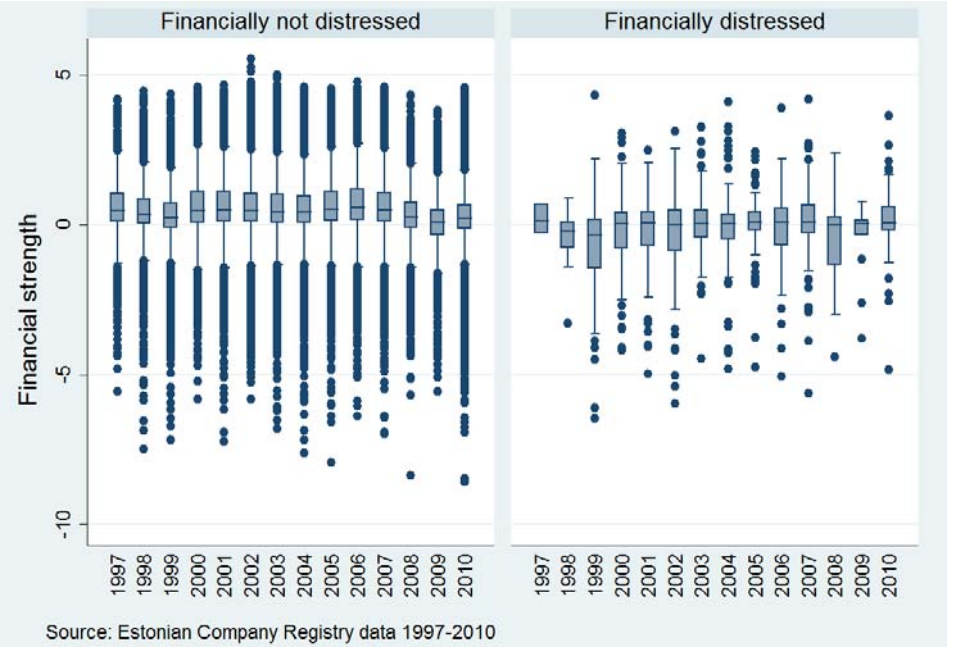

Figure 3. Financial strength distribution for distressed and non-distressed companies
Data source: Estonian Company Registry data 1997-2010

Figure 3 above illustrates the distributional properties of the Z-score, which is calculated as the profitability ($\frac{EBIT}{Assets}$) divided by the volatility in return on assets ($z = \frac{ROA}{standard\ deviation\ of\ ROA}$). The figure shows that the Z-score values are consistently higher for the non-distressed companies than for distressed companies, where distressed companies were in breach of the obligatory minimum equity requirement set by law. The adverse cyclical effect upon the Z-score is particularly notable for the years of the Russian and Asian crisis in 1997-1999 and for the years of the recent global financial crisis in 2008-2009, when the drop in the Z-score was larger for the group of financially distressed companies. This figure provides descriptive evidence for the broad consistency of the binary definition of financial distress in Paper I and the continuous definition of financial distress based on the Z-score, as employed in Paper II.

1.2. Investment by companies and their survival under macro-economic and cyclical effects and financial frictions

The literature on credit constraints and their cyclicality started to emerge in the late 1980s and early 1990s with the seminal work by Bernanke and Gertler (1989). These authors developed a neoclassical model for the business cycle and argued that a borrower having higher net worth reduces the agency costs of financing investment, as macroeconomic upturns improve net worth, lower financing costs and increase investment, while a downturn has the opposite effect on investment (ibid.). This strand of literature later became related to monetary policy literature (Mishkin, 1996), evolved into the financial accelerator framework (Bernanke et al., 1996), and was enriched by theoretical micro-level models of investments by companies and the credit constraints they faced (Aghion et al., 2010, 2014).

The monetary policy literature proposes two channels for monetary transmission, the interest rate channel and the credit channel (see Mishkin, 1996). The first channel represents how central banks influence the cost of capital and thus investment decisions for companies through their control of the short-term interest rate. The credit channel is assumed to amplify the interest channel effect by restricting how companies access finance through the adverse effect that monetary policy has on the external finance premium under informational asymmetries (see De Graeve, 2008). The direct effect of the credit channel is discussed under the financial accelerator framework pioneered by Bernanke et al. (1996), which posits that a company's spending, including spending on investments, is restricted by the net discounted value of its assets. This value decreases during cyclical downturns when cash flow generation is under pressure, and, moreover, increasing external finance premiums have an adverse impact on discounting rates for asset valuation. In addition, Mishkin (1996) points to an indirect effect of the credit channel that is enforced through financial intermediators, as the real sector effects are exacerbated by the weaker balance sheets of banks and other financial intermediaries, which restrain them from lending, limiting in turn the credit supply to real sector companies. See the further research on the impact of macroeconomic factors on company survival by Richardson et al. (1998), Liu (2004), and Bhattacharjee et al. (2009) among others.

In line with the financial accelerator framework, Aghion et al. (2010, 2014) put forward a theoretical micro-level model showing that the ability of a company to invest in long-term assets is reduced by increased credit constraints. They argue that in a perfect credit market, short-term investments are pro-cyclical and long-term productivity-enhancing investments are counter-cyclical. This stems from the Schumpeterian opportunity-cost effect, where a downturn means that there are fewer short-term investment options, so long-term investment projects are favoured, while the opposite happens during upturns. However, under credit constraints, this general effect on long-term investments gets reversed as all types of investment are now likely to be made in the same part of the cycle, the upturn (ibid.).

Empirical evidence has generally agreed that credit constraints have a negative effect on capital investment (see e.g. Fazzari et al., 1988; Li, 2011) and on other long-term and productivity-enhancing commitments like innovation and export activity (Gorodnichenko and Schnitzer, 2013) or research and development (R&D) activity (Männasoo and Meriküll, 2014, 2015). In the context of the 2008-2009 crisis, Campello et al. (2010) and Campello et al. (2011a and 2011b) reported empirical evidence that financially constrained companies tended to give up their investment, while non-constrained ones did not. A similar effect on European manufacturing companies has been reported by Buca and Vermeulen (2017). Hadlock and Pierce (2010) and Saeed and Vincent (2012) found that credit constraints are especially harmful in restraining investment by small and young companies. Gorodnichenko and Schnitzer (2013) found that credit constraints restrained domestic firms from innovation and exporting, while Männasoo and Meriküll (2014, 2015) demonstrated that credit constraints have a significant adverse effect on the R&D activity of companies in Central and Eastern European countries.

1.3. Endogenous effects on the financial standing and distress of companies

The early literature on financial distress showed that higher cash inflows and a favourable macroeconomic environment have a positive effect on company financial soundness. The ensuing line of research incorporating investments and their cyclicality as a way to explain and predict company financial distress realised that investment intensity is endogenous to the financial standing of companies and to their ability to generate cash inflows and is also determined by cyclical fluctuations in the macroeconomic environment. The firm productivity model proposed by Olley and Pakes (1996) for example recognises that production inputs and investments are endogenous to the productivity of firms. Productivity evidently has a strong correlation with the financial standing and financial soundness of a company.

The endogenous relations between the variables of interest and in contradiction to the cyclical implications lead to a number of methodological challenges in identifying the parameters of the distress factors. *Firstly*, the endogeneity issues prevail between the financial strength of companies and the intensity of their investment, since financially strong companies tend to invest more, and the returns from these investments strengthen those companies' financials. *Secondly*, cyclicality interacts with the success of investments or their rate of return, and failing to account for these interactions may bias the results. *Thirdly*, the financing structure of investments, or their gearing, makes an imprint on company finances, while its effect is also interacted with the cycle. High investment gearing brings higher risks, but depending on the phase of the business cycle, this risk might either be penalised in the downturn phase or be rewarded in the early upturn phase.

To tackle these problems, contemporary econometric methods including the dynamic endogenous variable models like the GMM estimators have to be applied

in linear settings and the control function approach or non-linear instrumental variable estimator has to be used in non-linear settings. Like Gorodnichenko and Schnitzer (2013), Paper III employs a non-linear instrumental variable IV-probit estimator, but it investigates the simultaneous effect of the endogenous investment-financing decision upon a company's financial distress as a binary variable. Paper II applies the linear GMM estimator to identify the cycle-investment and cycle-borrowing mean and interaction effects upon the company's financial strength defined as the continuous Z-score variable, as a ratio of the company liquidity reservoir and volatility of liquidity inflows. Schoder (2013) used the GMM estimator to identify the effect of the drop in demand during the global financial crisis over the supply effect from the monetary transmission channel and restricted access to finance during the crisis. Using evidence from US companies from 1977-2011 he found support for the drop in demand for credit having a prominent role in the effect of the credit supply limiting investment. This finding stresses the endogeneity in the investment behaviour of companies, which depends on the phase of the business cycle and on the concomitant financial standing of the company.

2. CONCEPTUAL AND METHODOLOGICAL SYNTHESIS

Aghion et al. (2010, 2014) follow the Schumpeterian opportunity cost argument and claim that short-term investments are pro-cyclical and long-term investments are counter-cyclical, except when companies face financial constraints, in which case long-term investments become pro-cyclical and short-term investments become counter-cyclical. As debt is largely used for financing investment then it can be inferred that demand for debt follows the same cyclical pattern and is counter-cyclical by nature. The recent literature on the credit commitments of banks has provided evidence for counter-cyclical credit demand from companies, demonstrating that credit is frontload at the onset of a crisis and that credit lines then get drawn down during that crisis (see for example Jimenez and Saurina, 2006, and Laidroo and Männasoo, 2017, among others).

The theoretical propositions by Aghion et al. (2010) on volatility and growth stress the liquidity risk related to long-term investment, which implies that companies that manage to absorb liquidity and broaden their funding base before the crisis and the credit contraction can maintain a stronger financial standing throughout the crisis. Evidently, companies with liquidity buffers will find themselves in a better position in the midst of the crisis, as they can maintain their productive capacity and know-how or re-allocate their resources towards enhancing productivity, which would be a desired counter-cyclical outcome in the Schumpeterian cleansing mechanism of crises.

Another important implication from the current line of research is the evidence that companies that made long-term investments shortly before the crisis were penalised financially more than companies that invested in short-term current assets at the onset of the crisis. This might sow the seed for adverse incentives where a smaller share of companies are ready to take the risk of long-term investment, and Aghion et al. (2010) suggest that this may lead to higher cyclical volatility and a lower mean rate of economic growth. In line with this argument, Rammer and Schubert (2016) have shown a sharp contraction in the number and share of German companies investing in innovation and R&D in the aftermath of the global financial crisis of 2008-2009, and this has led to a significant concentration of these long-term investments at fewer companies. When risk averse companies reduce their long-term investments or even refrain from making them, it has severe consequences for the economy at large, since it delays the broad-based economic recovery and inhibits sustained, inclusive economic growth.

The research underlying this thesis observed that counter-cyclical short-term investments are beneficial for company financial soundness. This finding fits well with the argument by Aghion et al. (2010, 2014) that short-term investment turns from being pro-cyclical to become counter-cyclical in a credit-constrained environment.

3. CONCLUSIONS AND DISCUSSION OF KEY RESULTS

The research in this thesis contributes by adding new micro-level empirical evidence on the linkages between cyclicality, investment and financial soundness, and demonstrates that all the investment-related factors like the type, timing, financing structure, investment intensity and industry matter for the financial soundness of a company.

The research presented in the thesis found supporting evidence that financial constraints impact long-term investments as predicted by theory and as shown by extant empirical evidence. Moreover, the research in the thesis stresses the aggravated adverse effect that highly-geared long-term investment can have on the financial standing of companies at the onset of a downturn (see Papers II and III). Credit market frictions tend to penalise companies that invest over the long term to a larger degree than companies that only commit to short-term investments in current assets. The Schumpeterian cleansing mechanisms of crises require at least neutral if not counter-cyclical financing to counter the downturn and crisis and to let growth recover through restructuring and activities to enhance productivity. The evidence from companies in Central and Eastern Europe (Paper II) suggests that access to finance in a downturn and crisis improves the financial soundness of companies, since it lets them alleviate the higher liquidity risk that comes from long-term investments in enhancing productivity and keep their capacity utilisation stable while still maintaining their productive capital and know-how, including the human capital and tacit knowledge needed for production. In other words, a frictionless credit market is required for long-term investment to be counter-cyclical. Another important finding is that frontloading credit shortly before a downturn or at the onset of a crisis relieved the detrimental effects that an economic slowdown can have on company finances. In general this study corroborates the claim that credit constraints undermine plans by companies to restructure and enhance their productivity, aggravating the pro-cyclical patterns of overinvestment and underinvestment.

In a similar vein, the findings from Paper III stress that credit frictions make companies vulnerable financially, since the more intense the pre-crisis investment is and the higher the associated debt leverage or investment gearing, the higher the chance becomes of financial distress occurring in the downturn of the cycle. In that light, policy measures that relieve the temporary financial strains for companies with sound long-term investment strategies would mitigate the negative, persistent effects of a crisis on company financial soundness and aggregate growth. Equally, as new inflows of debt and improvements in liquidity during a downturn and during crises are found by Paper II to improve the financial soundness of companies, then policy measures that facilitate access to finance or grant financing support during a crisis can also alleviate the detrimental effects of cyclical downturns.

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ABSTRACT

CYCLICALITY, CORPORATE INVESTMENTS AND FINANCIAL SOUNDNESS: EVIDENCE FROM CENTRAL AND EASTERN EUROPEAN COUNTRIES

The thesis builds on three co-authored research papers that provide novel micro-level empirical evidence on the cyclicality-investments-financial soundness linkages. The pursued line of research contributes by addressing the investments cyclicality issue from company level perspective.

The confounding cyclicality effect is one of the key elements throughout all three publications and it has been researched in the context of the 2008-2009 global financial crisis, but in Papers I and II on Estonian dataset also in the context of the 1997-1998 Asian and Russian financial crisis. Two different data sources were used: (1) Estonian Business Registry data 1995-2010 and (2) Business Environment and Enterprise Performance Survey round IV data in conjunction with Financial Crisis Survey 2009-2010.

The contribution of the thesis is threefold: firstly it corroborates empirically the theoretical proposition that financial constraints lead to underinvestment at cycle down-turns, which prolongs recovery of economic growth; secondly, it shows that long-term investments and in particular the highly geared long-term investments at the onset of downturn and crisis have an adverse effect upon company's financial standing; thirdly the results suggest that the frontloading of credit and improvement of liquidity at the onset of crisis alleviates the detrimental effects of economic slowdown and enables the companies to re-direct their underutilized resources and capacities towards restructuring, productivity enhancing activities or towards maintenance of their production capacity and quality.

KOKKUVÕTE

MAJANDUSE TSÜKLILISUS, ETTEVÕTETE INVESTEERINGUD NING FINANTSVÕIMEKUS: UURIMISTULEMUSI KESK- JA IDA-EUROOPA ANDMETEL

Käesolev doktoriväitekiri põhineb kolmel kaasautorluses kirjutatud teadusartiklil, mis panustavad empiirilisse tõendusmaterjali seostest majandustsükli, krediidipiirangute, ettevõtete investeeringute ja ettevõtete finantsvõimekuse vahel. Teadusartiklites esitatud uuringute peamine eesmärk on hinnata ettevõtete investeerimis- ja finantseerimisotsuste ning majandustsükli koosmõju ettevõtete jätkusuutlikkusele.

Teadusartikleid ühendavaks läbivaks teljeks on 2008-2009 globaalse majanduskriisi kontekst, mida täiendab kahe Eesti andmestikul põhineva artikli puhul ka 1997.-1999. aasta Aasia ja Vene finantskriiside kogemus. Empiiriline analüüs tugineb kahel erineval ettevõttetasandi andmestikul: (1) Äriregistri andmed Eesti ettevõtete finantsaruannete kohta perioodil 1995-2010 ja (2) *Business Environment and Enterprise Performance Survey* 2007-2009 küsitlusuuringu ja *Financial Crisis Survey* 2009-2010 küsitlusuuringu ühendatud andmed viie Kesk- ja Ida-Euroopa riigi kohta.

Uurimus panustab majandusteadusesse mitmete oluliste järeldustega. Esiteks kinnitavad empiirilised uurimisleiud teoorias väljatoodud seisukohta, osundades finantspiirangutest ja ettevõtete nõrgenenud finantsseisukorrast tingitud madalale investeerimistasemele majandustsükli langusfaasis, mis on üheks oluliseks majanduskasvu taastumist pidurdavaks faktoriks. Teiseks näitavad tulemused, et enne majanduslangust sooritatud pikaajalised investeeringud, sealhulgas eriti kõrge finantsvõimendusega pikaajalised investeeringud, toovad kaasa kõrgenenud finantsriski ning seavad ohtu ettevõtte jätkusuutlikkuse. Kolmandaks toovad tulemused esile, et ettevõtted, millel õnnestus kaasata laenuressurssi ning tugevdada oma likviidsuspuhvreid enne majanduslanguse perioodi, suudavad säilitada oma finantsseisundit tugevamana kriisi ajal, kuna finantsvõimenduse abil on võimalik alakoormatud tootmisressursse ümber korraldada ning arendada tootlikkust, säilitades tootmisressursse ning sellega seotud teadmust.

APPENDIX 1. PAPER I

FINANCIAL DISTRESS AND CYCLE-SENSITIVE CORPORATE INVESTMENTS

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Financial distress and cycle-sensitive corporate investments

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This paper attempts to explain the link between corporate investments in different phases of the economic cycle and company financial distress. The data were derived from the Estonian Centre of Registers and Information Systems and contained the population of Estonian businesses from four economic activity areas – manufacturing; wholesale and retail trade; transportation and storage; and construction and real estate – and covered the period from 1995 to 2010. A firm was defined as distressed if it breached the minimum capital requirements set by law. The results demonstrate that all the investment-related factors matter for financial distress, with timing, intensity, sector, and type of investment all playing a role. Furthermore, the data seem to suggest that investment in tangibles is more cycle-sensitive for the transport and construction and real estate sectors and investment in working capital is more cycle-sensitive for manufacturing and merchandise, which stresses the importance of getting the timing right for different investment types in different industries.

Keywords: company investments; corporate distress; cyclicality

JEL Classifications: G01; G31; G32

1. Introduction

Corporate financial distress and bankruptcy issues have been the subject of extensive research for more than 40 years, but the complexity of the factors and influences determining the success or failure of firms constantly poses new challenges for researchers. The recent global financial turmoil in 2008–2009 again vividly stressed the importance of sound and wise management practices. The macroeconomic fluctuations and instabilities have become more pronounced than ever before, and this means that better planning and precautionary measures are called for at the micro-level for corporate planning and decision-making. Commensurate investment decisions are of central importance for firm growth, higher productivity, and improved competitiveness, as both overinvestment and underinvestment may lead to severe consequences, which in the worst case can result in company distress or failure. The rapid advancement and implementation of new technologies, the emergence of new markets, and sudden shifts in consumers' preferences, all present new challenges for corporate investment policy. The strong swings on the demand side and on the supply side may lead to herding behaviour and overinvestment in expectation of a continued increase in demand and an

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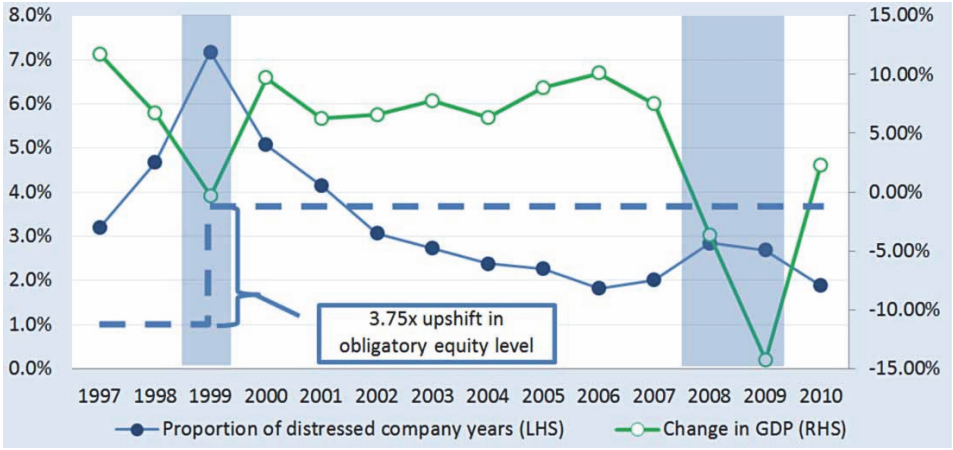

Figure 1. Distress episodes and real GDP growth.
Notes: A firm was defined as distressed if it breached the minimum capital requirements set by law. The obligatory equity level has been EUR 2.4 thousand for private limited companies and EUR 24 thousand for public limited companies since 1999; in 1995–1998, the obligatory equity levels were EUR 0.64 thousand for private limited companies and EUR 6.4 thousand for public limited companies. Two shadowed areas denote the crises of 1999 and 2008–2009. The source for real GDP growth is Statistics Estonia (2013).

improvement in productivity as new technologies are adopted. Our research aims to contribute to the conceptual strand of the literature by seeking to find the link between macroeconomic fluctuations, company investment, and eventual financial distress. Investments create negative cash flows and put company finances under pressure, and according to Taffler (1983), higher volatility in cash flows leads to elevated risk of financial distress. Adding macroeconomic fluctuations into this regularity, we argue that higher investment before an economic downturn increases the probability of financial distress when the recession materializes.

Our paper contributes in many respects. Firstly, we investigate the link between company investments and financial distress in different phases of the economic cycle, which to the best of our knowledge has not been extensively addressed before. We also conduct the estimations separately for different industries, since the various sectors have been subject to the bubble and bust patterns to a very different degree and extent. Moreover, the analysis considers the intensity of different types of investment, looking at investments in current assets and investments in tangibles. Secondly, we had a population data set that covered a long time frame of 16 years, which allowed us to investigate the distress in different sectors over two major crisis episodes in 1999 and 2008–2009 (Figure 1). Furthermore, investment activity is discrete and this means the population data set gave us good hindsight into the problem, in contrast to smaller data sets, which may limit the study of rare events. Thirdly, we addressed the elasticity effects of investment-cycle interaction variables by calculating the combined effect on company distress at different investment intensity levels. We argue that this view provides novel insights.

The results confirm that all the factors matter for financial distress, with investment cyclicality, investment intensity, type of investment, and the sector where the investment was made all playing a role.

This paper is organized as follows. The literature review and theoretical foundations are presented in Section 2. Section 3 introduces the data, describes the variables, and explains the research methodology. The results are reported and discussed in Section 4. Section 5 concludes.

2. Literature review

Company bankruptcy and financial distress have been extensively researched since the mid-1960s to make conceptual advances for the determinants, associations, and causalities between the various indicators or symptoms of financial distress and their implications for company failure. Comprehensive literature surveys have been conducted by Altman and Narayanan (1997), Keasey and Watson (1991), Balcaen and Ooghe (2004), Aziz and Dar (2006), Bellovary, Giacomino, and Akers (2007), Ravi Kumar and Ravi (2007), and more recently, Verikas, Kalsyte, Bacauskiene, and Gelzinis (2010).

Firm investments can be divided into three types, with investments in current assets, fixed assets, and human capital. The investment intensity for the first two of these can be derived from the cash flow statement or from its predecessor the fund flow statement. The third can be a part of period costs, appearing, for example, as part of training costs, and therefore, can be less visible from standard accounts.

Three review articles – Sharma (2001), Bellovary et al. (2007), and Ravi Kumar and Ravi (2007) – were used for locating the earlier studies that used financial ratios based on investment-related cash flow, and this resulted in three types of outcome. In the first type of outcome, statistically significant evidence has been found that higher capital expenditures one year (Aziz, Emanuel, & Lawson, 1988, p. 429; Aziz & Lawson, 1989, p. 57; Gentry, Newbold, & Whitford, 1985a, p. 52) and four years (Aziz et al., 1988, p. 429) before failure and higher investment in receivables one year (Gentry et al., 1985a, p. 52) before failure lower the probability of a firm going bankrupt. All three of these papers used fund flow statement information and a US data set. Secondly, there are some research papers (Gentry, Newbold, & Whitford, 1985b; McKee & Lensberg, 2002; Min & Lee, 2005) that included financial ratios based on investment-related cash flow in their initial battery of variables, but did not find statistically significant evidence from them. Thirdly, there are papers (McKee, 2003; Park & Han, 2002; Piramuthu, Ragavan, & Shaw, 1998) that focused on methodological aspects of data mining approaches and found statistically significant evidence for investment-related variables, but did not elaborate the findings further (probably because the low transparency of data mining methods somewhat restricted such elaborations).

Only a few years after Beaver's (1966) and Altman's (1968) pioneering studies, Johnson (1970) suggested that economic conditions may have discriminating power in firm failure prediction, and many studies since then have shown that this is indeed so. Richardson, Kane, and Lobingier (1998) showed that different accrual-based financial ratios can predict corporate failure, depending on the underlying and expected economic conditions. Bhattacharjee, Higson, Holly, and Kattuman (2009, p. 122) showed that an increase in US output per capita lowers the probability of a UK firm going bankrupt; that uncertainty in the form of sharp increases in inflation and a sharp depreciation of the pound sterling affect freshly listed UK firms aged 0–4 years adversely; and that higher volatility in RPI inflation lowers the probability of UK firms listed for more than 25 years going bankrupt. Christidis and Gregory (2010) showed that a higher log excess return over the FTSE All Share Index lowers the probability of bankruptcy.

Although the effects of investments and the economic cycle on financial distress have been addressed separately, we argue that there is a gap in the current research for explaining the link between financial distress and investments in different phases of the economic cycle.

Of the five more commonly used theoretical approaches,[1] two directly address the influence of investment decisions on financial distress. These two are coalition behaviour theory (White, 1980) and cash flow theory (Aziz et al., 1988; Aziz & Lawson, 1989; Gentry et al., 1985a). However, four of the theories – cash flow theory, gamblers ruin theory, income finance theory, and option theory – take the investment decision into account indirectly through the profitability of the investment.

Our model is based on Beaver's (1966) cash flow theory, which was further elaborated by Taffler (1983). Beaver's cash flow theory views the firm as 'a reservoir of liquid assets which is supplied by inflows and drained by outflows' and states the following four *ceteris paribus* propositions: (I) the larger the reservoir, the smaller the probability of failure; (II) the larger the net liquid-asset flow from operations (i.e. cash flow), the smaller the probability of failure; (III) the larger the amount of debt held, the greater the probability of failure; and (IV) the larger the fund expenditures for operations, the greater the probability of failure (1966, p. 80). Taffler added a fifth *ceteris paribus* proposition that the more highly variable the inflows, outflows, and claims on firm, the greater the probability of failure (1983, p. 304).

We argue that a deteriorating economic environment increases the volatility of inflows and outflows in cycle-sensitive industries. Taking Beaver's (1966) fourth proposition and Taffler's (1983) fifth proposition, we argue that the larger the investment intensity (fund expenditures for operations) before the advent of weakening economic conditions (more variable inflows and outflows), the greater the probability of failure. As our research is based on cash flow theory, we also tried to find evidence for the underlying basis of cash flow theory by checking the validity of the other three propositions (Beaver's I, II, and III propositions (1966)).

3. Data and methodology

The data were derived from the Estonian Centre of Registers and Information Systems and contained the population of Estonian businesses from four economic activity areas – manufacturing; wholesale and retail trade; transportation and storage; and construction and real estate – and covered the period from 1995 to 2010.

The target population contained privately owned companies in operation for at least three consecutive years, so all income statement and balance sheet data entered in the first lag, while the fund flow approach was used for cash flow variables by taking the first and second lags of balance sheet variables and the first lag of income statement variables. The fund flow approach was chosen as the data set did not contain the cash flow information from before 2005 and the aim of the research was to take data over several economic cycles.

In order to exclude the impact of outliers, the 1% lower and upper tail observations were excluded for accrual accounts-based ratios; due to the discrete nature of investment, business logic was applied for investment-related cash flow ratios, where observations showing investment or disinvestment of over 100% of the asset size were discarded as outliers. The effects of erroneous accounts and companies without economic activity were avoided by the inclusion only of those companies that had positive sales and asset levels and a balanced balance sheet.

After cuts the data set contained 133.1 thousand company-years, of which 4.1 thousand were distressed company-years. Table 1 presents summary statistics for the pooled sample together with the industry-level aggregates and definitions of variables. The data set mainly contained small- and medium-sized companies with an average asset size of EUR 0.66 m.

Our target variable, the company financial distress, is defined as set out in Estonian law, so a company is defined as financially distressed if its equity level falls below the minimum obligatory equity level. Similar to Männasoo (2008), our choice of definition was motivated by our interest in financial distress that is better observable, not dependent on legal procedures, and more broadly influential on the economy than bankruptcy, and also by our interest in financial distress that has a strong impact on shareholders' equity and by the availability of the indicator for the population of Estonian businesses.

Three accrual accounts-based ratios (working capital requirement to total assets, equity ratio and return on total assets) and the size variable (Size) and the private/public company type

Table 1. Summary statistics by sector.

Variable	Mean	Std. Dev.	Min.	Max.	Mean	Std. Dev.	Min.	Max.
	Manufacturing *N*=32,793 of which distressed=979 and at recession=6416				Transport *N*=14,893 of which distressed=366 and at recession=1352			
WCR_TA	11.333	26.441	−94.740	91.470	3.025	23.111	−96.120	91.620
E_TA	53.779	27.351	0.070	99.990	49.754	27.798	0.140	99.990
ROA	9.175	21.959	−168.420	94.34	9.916	21.148	−201.150	97.420
Size	0.959	4.341	0.001	160.774	0.648	3.758	0.001	175.915
Age	7.560	4.105	1.000	19.000	6.416	3.575	0.000	19.000
LI	21.755	37.406	−65.800	74.300	28.377	31.558	−65.800	74.300
Type	0.276	0.447	0.000	1.000	0.247	0.431	0.000	1.000
dWCR_TA	2.309	20.559	−99.500	99.980	1.431	20.140	−98.110	99.310
dT_TA	9.067	17.886	−98.940	99.990	14.597	24.546	−96.640	99.720
	Construction and real estate *N*=25,664 of which distressed=693 and at recession=2487				Merchandise *N*=59,764 of which distressed=2043 and at recession=5918			
WCR_TA	6.245	27.452	−99.190	91.160	21.399	30.300	−99.750	92.080
E_TA	53.560	29.056	0.040	99.990	46.690	27.973	0.030	99.990
ROA	10.696	23.543	−159.450	97.890	8.561	19.623	−187.960	97.930
Size	0.804	4.082	0.001	177.683	0.432	1.935	0.001	80.640
Age	6.736	3.799	0.000	19.000	6.657	3.566	1.000	19.000
LI	27.953	31.191	−65.800	74.300	26.755	31.954	−65.800	74.300
Type	0.229	0.420	0.000	1.000	0.199	0.399	0.000	1.000
dWCR_TA	1.904	23.650	−99.960	99.940	3.996	22.489	−99.980	99.970
dT_TA	7.717	18.845	−99.960	99.760	5.321	14.727	−97.860	99.950
	Total *N*=133114 of which distressed=4081 and at recession=16173							
WCR_TA	13.942	28.998	−99.750	92.080				
E_TA	50.104	28.208	0.030	99.990				
ROA	9.276	21.195	−201.150	97.930				
Size	0.658	3.341	0.001	177.683				
Age	6.868	3.773	0.000	19.000				
LI	25.936	33.289	−65.800	74.300				
Type	0.229	0.42	0.000	1.000				
dWCR_TA	2.890	22.033	−99.980	99.980				
dT_TA	7.744	17.899	−99.960	99.990				

Notes: Definitions of variables: WCR_TA: working capital requirement/total assets, where working capital requirement = non-interest bearing current assets − non-interest bearing current liabilities; E_TA: equity ratio (%); ROA: return on total assets (%); Size: total assets (EURm); Age: time from registering in the Estonian Centre of Registers and Information Systems (years); LI: change in the OMX Tallinn stock index (%); Type: private/public company type dummy (0/1); dWCR_TA: change in working capital requirement/total assets (%); dT_TA: change in tangible assets (excluding land, real estate investments and financial investments)/total assets (%); *N*: number of company-years.

dummy (Type) were selected to suit the cash flow theory model, which requires the inclusion of liquidity/equity buffer and inflow/outflow variables, where 'Size' together with equity ratio determines the equity buffer size and 'Type' determines the acceptable level for the equity buffer size. Although we tested several financial ratios we only included three due to their clear interpretation and absence of multicollinearity problem. Lender-related cash flow to total assets, which is a financial constraint variable, was left out due to its strong correlation with other variables and because the effect can be indirectly assessed through the equity ratio.

The overall model controls for sector fixed effects.[2] The dynamic period of transition from 1995 to 2010 was controlled with period dummies (1995–1997, 1998–2000, 2001–2003, 2004–2007, and 2008–2010), since annual dummies would be collinear with the cycle dummy.[3]

We had 18 economic indicators in our initial variable list.[4] Change in the OMX Tallinn stock index, which contains local listed companies, was included due to its good explanatory power and low correlation with other variables.

The three interacted variables were used in two different set-ups of the models to measure the importance of investment type (investment in working capital or tangibles), investment intensity, and investment timing. In the first set-up, the working capital investment intensity (dWCR_TA) and in the second set-up, the tangible asset investment intensity (dT_TA) were interacted with the GDP decline dummy (GDP-), which had the value 0 if the next year had positive GDP growth and 1 if the next year had negative GDP growth.

Both model specifications controlled for a number of other variables including company age, asset size, three accrual financial ratios (working capital requirement to total assets, equity ratio, and return on total assets), and one leading indicator (change in the OMX Tallinn stock index). The investment not interacted with the economic downturn dummy was also controlled for, so the model focusing on the interaction of tangible investments with the economic setback controlled for working capital investments and vice versa. To keep the model simple, we used an overall GDP-based cycle variable instead of a sector-level cycle variable (sector value added). We used robust and company-level clustered standard errors.

We estimated the importance of the investment intensity by first running the logit model with cycle-interacted investment variables and then calculating and plotting the combined impact at different investment levels.[5] We used odds ratios instead of marginal effects to show the combined elasticity effect.

4. Results and discussion

The model specifications focusing on the interactions with the economic downturn of working capital and of tangible investments are presented in Tables 2 and 3, respectively. To give an even better picture of the combined effect of investment intensities and cyclical vulnerability, the combinations of investment and economic setback interactions were obtained for different investment levels, and the results of this are presented in Figures 2 and 3.

4.1. *Evidence for the underlying basis of the cash flow theory*

The estimation results for the control variables remained fairly stable across different model specifications in the pooled and industry-level samples. In order to evaluate the importance of the reservoir (Beaver's first proposition), we looked at the coefficients of the private/public company type dummy (Type), the equity ratio (E_TA), asset size (Size), working capital requirement to total assets (WCR_TA), and the period dummies, all of which had the expected signs. The public limited companies subject to higher capital requirements by law turned out to be more likely to breach the prescribed capital levels and become distressed. Higher equity-to-asset ratios and higher asset size were associated with lower probability of distress.

Period dummies decreased as expected over the period 1998–2010. Interestingly this trend is similar to the change in consumer price index (CPI) over the same period.[6] Because the equity-to-asset ratio is the mirror of leverage or the debt-to-asset ratio, the other implication from the equity ratio was that lower exposure to debt reduces the company distress hazard (Beaver's third proposition). In assessing the importance of inflows to the reservoir (Beaver's second proposition), we focused on the return on asset ratio (ROA), which confirmed that higher returns imply lower distress risk. The results obtained on control variables were closely in line with the broad empirical evidence maintaining that the liquidity, leverage, and profitability ratios constitute a set of robust predictors of firm distress (see, for example, the list of predictors present in five or more studies; Bellovary et al., 2007, p. 42).

Table 2. Working capital investment intensity impact on distress.

Variable	Total	Manufacturing	Transport	Construction–real estate	Merchandise
WCR_TA	0.9967***	0.9958***	1.0016	0.9985	0.9958***
	(0.0006)	(0.0014)	(0.0026)	(0.0016)	(0.0009)
E_TA	0.9633***	0.9598***	0.9632***	0.9637***	0.9648***
	(0.0009)	(0.0017)	(0.0029)	(0.0020)	(0.0013)
ROA	0.9847***	0.9854***	0.9875***	0.9881***	0.9817***
	(0.0009)	(0.0017)	(0.0026)	(0.0019)	(0.0013)
Size	0.6799***	0.7130***	0.6280***	0.7006***	0.6649***
	(0.0107)	(0.0215)	(0.0334)	(0.0235)	(0.0161)
Age	0.9742***	0.9895	0.9755	0.9762*	0.9642***
	(0.0054)	(0.0100)	(0.0192)	(0.0125)	(0.0082)
LI	0.9984***	0.9990	0.9973	0.9992	0.9977***
	(0.0006)	(0.0011)	(0.0019)	(0.0015)	(0.0009)
Type	1.2693***	1.2550*	1.5533**	1.0854	1.2818***
	(0.0735)	(0.1457)	(0.2761)	(0.1457)	(0.1115)
GDP-	1.3556***	1.1644	1.6747***	1.4467***	1.3806***
	(0.0646)	(0.1139)	(0.2638)	(0.1966)	(0.0948)
dT_TA	0.9962***	0.9939***	0.9977	0.9991	0.9949***
	(0.0009)	(0.0018)	(0.0021)	(0.0019)	(0.0015)
dWCR_TA	1.0004	1.0000	0.9989	1.0006	1.0008
	(0.0009)	(0.0019)	(0.0034)	(0.0018)	(0.0013)
dWCR_TAxGDP-	1.0031*	1.0084**	1.0030	0.9975	1.0030
	(0.0018)	(0.0036)	(0.0056)	(0.0039)	(0.0026)
Manufacturing	1.2603***	–	–	–	–
	(0.0565)	–	–	–	–
Per95-97	1.2019	1.3703	0.8482	1.2634	0.9786
	(0.1414)	(0.2822)	(0.4148)	(0.3610)	(0.2110)
Per95-00	1.6786***	1.6330***	1.1470	1.7578***	1.4810**
	(0.1549)	(0.2378)	(0.4610)	(0.3788)	(0.2766)
Per01-03	1.3963***	1.5032***	0.9351	1.2878	1.2594
	(0.1317)	(0.2196)	(0.3711)	(0.3113)	(0.2294)
Per04-07	1.2775***	1.4636***	1.2000	1.0665	1.0676
	(0.1152)	(0.1935)	(0.4676)	(0.2545)	(0.1942)
No of obs.	133,114	32,793	14,893	25,664	59,764
No of clust.	23,152	6155	3095	6856	12,299
R^2	0.14	0.16	0.12	0.14	0.14
Wald chi^2	4018.91	1179.72	383.48	776.83	1849.97
LL	−1.6e+04	−3714.70	−1509.40	−2724.70	−7649.99

Notes: Dependent variable – Company financial distress dummy; 1 if distressed. Logistic model estimations with odds ratios reported. Clustered standard errors are given in parentheses enabling intragroup correlation across the observations of the same company. Only the significant sector dummy variable for Manufacturing is reported, with the Merchandise sector as the base category. For definitions of variables, see the footnote of Table 1.
*Statistical significance at the level of 10%.
**Statistical significance at the level of 5%.
***Statistical significance at the level of 1%.

4.2. *Sectoral variation*

The estimation results for the sector and period dummies also remained fairly stable between the two different set-ups of the models. The manufacturing sector showed 26% higher statistically significant exposure to distress risk than the merchandise sector, whereas the other two sectors did not show any statistically significant difference.

Table 3. Tangible investment intensity impact on distress.

Variable	Total	Manufacturing	Transport	Construction–real estate	Merchandise
WCR_TA	0.9967***	0.9958***	1.0016	0.9985	0.9958***
	(0.0006)	(0.0014)	(0.0026)	(0.0016)	(0.0009)
E_TA	0.9633***	0.9598***	0.9632***	0.9637***	0.9647***
	(0.0009)	(0.0017)	(0.0029)	(0.0020)	(0.0013)
ROA	0.9847***	0.9854***	0.9874***	0.9882***	0.9816***
	(0.0009)	(0.0017)	(0.0026)	(0.0019)	(0.0013)
Size	0.6798***	0.7126***	0.6279***	0.7006***	0.6647***
	(0.0107)	(0.0214)	(0.0334)	(0.0235)	(0.0161)
Age	0.9742***	0.9894	0.9754	0.9763*	0.9644***
	(0.0054)	(0.0100)	(0.0192)	(0.0125)	(0.0082)
LI	0.9985***	0.9991	0.9974	0.9992	0.9977***
	(0.0006)	(0.0011)	(0.0019)	(0.0015)	(0.0009)
Type	1.2688***	1.2531*	1.5564**	1.0850	1.2810***
	(0.0735)	(0.1454)	(0.2771)	(0.1456)	(0.1115)
GDP-	1.3701***	1.1382	1.7437***	1.4211**	1.4295***
	(0.0697)	(0.1191)	(0.2923)	(0.2104)	(0.1022)
dWCR_TA	1.0010	1.0016	0.9995	1.0001	1.0014
	(0.0008)	(0.0017)	(0.0030)	(0.0017)	(0.0012)
dT_TA	0.9964***	0.9932***	0.9983	0.9986	0.9960**
	(0.0010)	(0.0021)	(0.0024)	(0.0020)	(0.0017)
dT_TAxGDP-	0.9987	1.0034	0.9965	1.0027	0.9945
	(0.0024)	(0.0045)	(0.0048)	(0.0056)	(0.0040)
Manufacturing	1.2600***	–	–	–	–
	(0.0565)	–	–	–	–
Per95-97	1.2103	1.3996	0.8475	1.2622	0.9846
	(0.1423)	(0.2879)	(0.4143)	(0.3609)	(0.2126)
Per95-00	1.6886***	1.6568***	1.1489	1.7554***	1.4923**
	(0.1560)	(0.2415)	(0.4617)	(0.3789)	(0.2797)
Per01-03	1.4042***	1.5244***	0.9322	1.2836	1.2696
	(0.1327)	(0.2231)	(0.3704)	(0.3104)	(0.2323)
Per04-07	1.2848***	1.4867***	1.1957	1.0640	1.0750
	(0.1160)	(0.1970)	(0.4664)	(0.2535)	(0.1964)
No of obs.	133,114	32,793	14,893	25,664	59,764
No of clust.	23,152	6155	3095	6856	12,299
R^2	0.14	0.16	0.12	0.14	0.14
Wald chi^2	4019.54	1173.52	382.79	776.11	1849.04
LL	−1.6e+04	−3717.34	−1509.35	−2724.78	−7649.77

Notes: Dependent variable – Company financial distress dummy; 1 if distressed. Logistic model estimations with odds ratios reported. Clustered standard errors are given in parentheses enabling intragroup correlation across the observations of the same company. Only the significant sector dummy variable for Manufacturing is reported, with the Merchandise sector as the base category. For definitions of variables, see the footnote of Table 1.
*Statistical significance at the level of 10%.
**Statistical significance at the level of 5%.
***Statistical significance at the level of 1%.

4.3. *Stand-alone cycle sensitivity*

The estimation results for the GDP dummies come out differently for different industries. The overall effect from the downturn increased distress risk by a factor of 1.36–1.37 for all companies. The transport sector demonstrated the highest sensitivity to economic recession with distress risk rising 1.67–1.74 times, probably because Estonia is a small open economy where import and export levels are both close to 70% of GDP. The merchandise and real

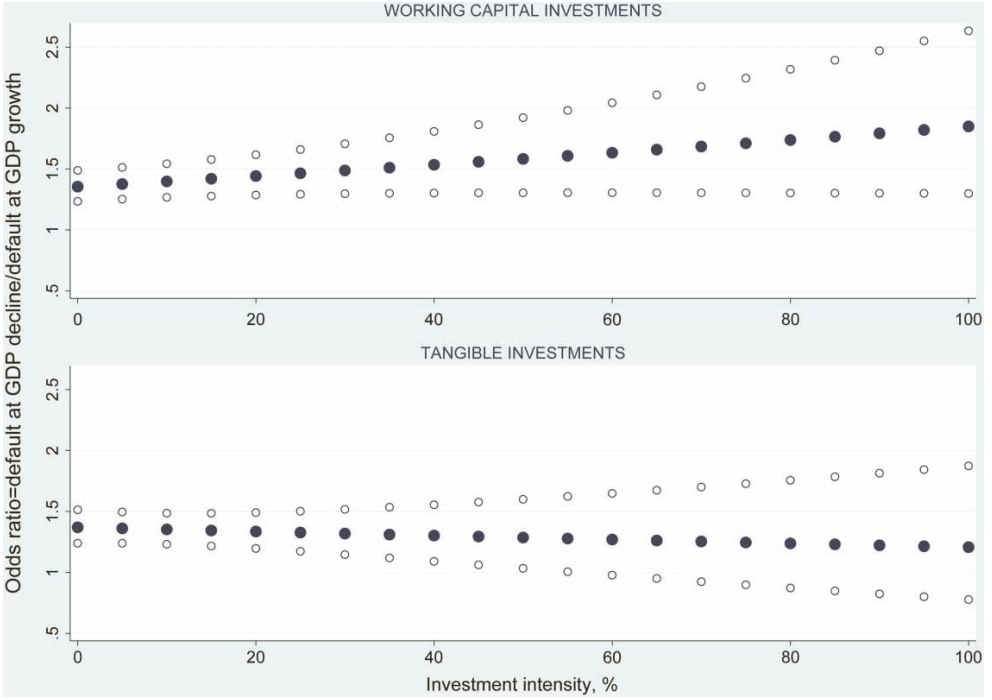

Figure 2. Odds ratios at different levels of investment intensity with 95% confidence intervals.

estate sectors showed average sensitivity to the downturn of 1.38–1.45 and manufacturing had the lowest sensitivity at 1.14–1.16. The figure for manufacturing was not statistically significant probably because of the great diversity within the sector.

4.4. *Cycle sensitivity of investments*

The combined effect on financial distress from investment before the economic downturn showed that distress risk increases moderately from a factor of 1.36 to 1.8 for working capital investments and decreases from 1.37 to 1.2 for tangible investments, while investment intensity increased from 0% to 100% (Figure 3). As the 95% confidence interval stayed above 1 for all working capital investment intensity levels, the effect can be taken as unequivocal. In contrast, the 1 level was breached at the 55% intensity level for tangible investments making the risk-decreasing effect equivocal for higher intensities.

The combined effect for different industries (Figure 3) showed great heterogeneity between the sectors.

Firstly the effect on financial distress went in different directions. Increased working capital investment intensity increased the distress risk in manufacturing, transport, and the merchandise sector, whereas interestingly the effect was the opposite in the construction and real estate sectors (notice that odds ratio lines on Figures 2 and 3 start from GDP- value level that are presented in Tables 2 and 3 and have upward or downward trend depending whether investment downturn interaction term's odds ratio is over or below 1.0 level). This can be explained by the importance of a solid pipeline of ongoing projects for construction or of later stage developments for real estate ahead of an economic contraction, both of which are reflected in increased

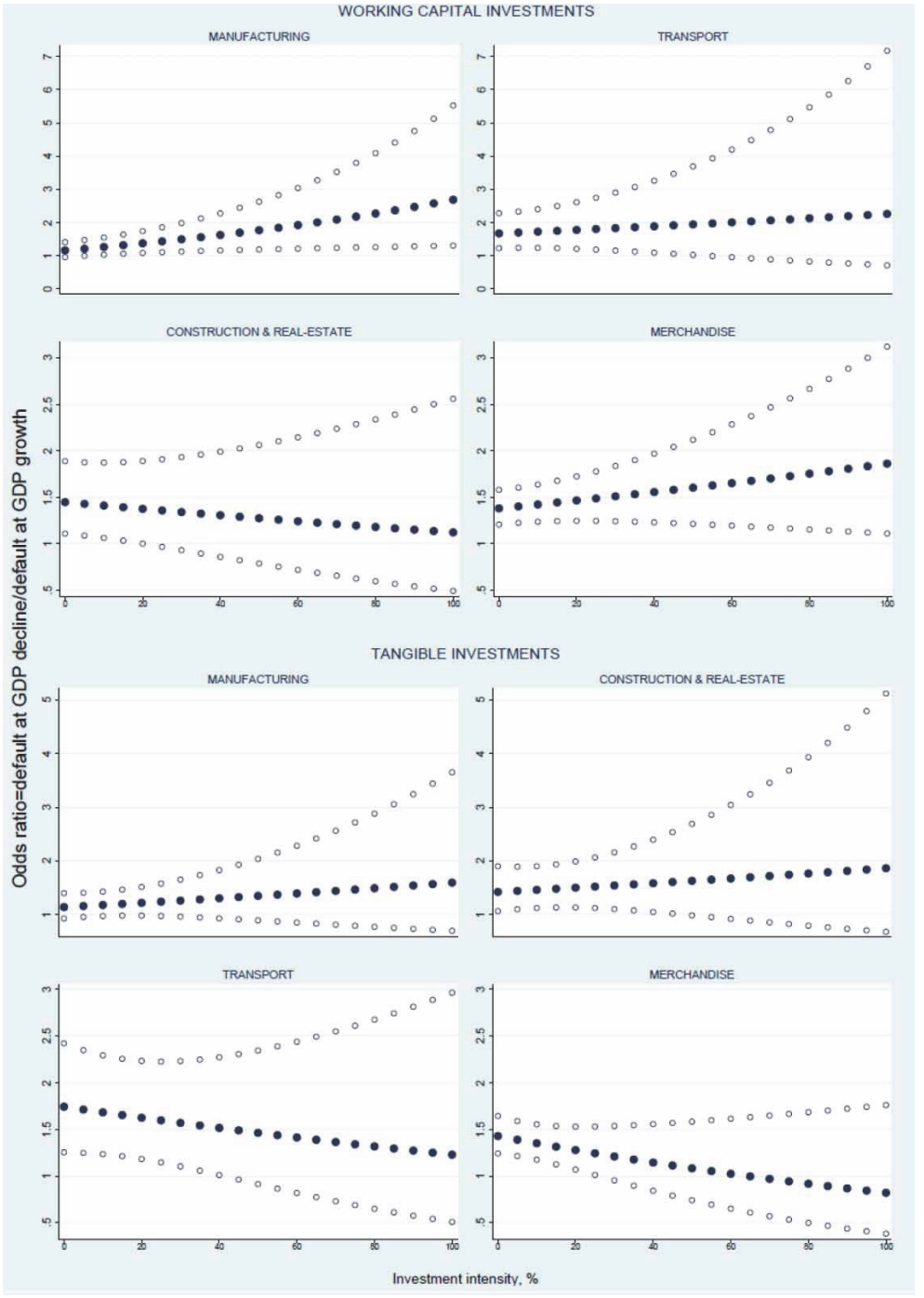

Figure 3. Odds ratios at different levels of investment intensity with 95% confidence intervals by industries.

inventory levels. In contrast, increased tangible investment intensity had a risk-decreasing effect for transport and merchandise and a risk-increasing effect in the other two sectors. In these two cases, this might reflect investments in efficiency and new facilities, both of which can improve competitiveness and resilience towards an adverse economic environment.

Secondly, the investment intensity had varying elasticity, with the manufacturing and merchandise sectors, which hold larger inventories, showing higher elasticity in working capital investment. At the same time, the transport, manufacturing, and merchandise sectors, which have a high share of tangibles, showed higher elasticity in tangible investment.

Thirdly, the investment intensity did not show an unequivocal effect after the 20–40% working capital investment intensity level was reached in the transport and construction and real estate sectors. The unequivocal effect for tangible investment intensity disappeared in all sectors after the 45% investment intensity level was reached.

Finally, the confidence intervals decreased at moderate tangible intensity levels of 5–30% for construction and real estate and 5–25% for transport, indicating that the investments are probably made in set amounts from assets or in chunks that increase the statistical significance of these investment levels.

5. Conclusions

Our study confirms the conceptual propositions (Beaver, 1966; Taffler, 1983) and broad empirical evidence maintaining that liquidity, leverage, and profitability ratios constitute a set of robust predictors of firm distress. We elaborate the empirical model by including an economic downturn dummy variable to investigate the timing effect of investments across industries. Moreover, we consider two types of investment, looking at investments in working capital and tangible investments separately to uncover diversity in the investments structure. Our results reveal a remarkable diversity in investment types and industry sectors. The degree to which industries are exposed to distress risk varies depending on the economic environment and the type of investment made during the run-up to an economic recession.

Tangible investments seemed to improve efficiency and competitiveness in the merchandise and manufacturing sectors with no harmful effect ahead of an economic recession. The reverse was true for the transport and construction and real estate sectors, where high tangible investments during the run-up to an economic contraction significantly increased the company distress risk. In contrast to the tangible investments, overly high working capital investments endangered the viability of manufacturing and merchandise companies, where exposure to inventories is larger ahead of a deterioration in the economic environment. It appears that working capital investments, which reflect short-term planning and address current market demand, can be badly hit at times of cyclical contraction in sectors exposed to large inventories.

In general, the results demonstrate that all the investment-related factors matter for financial distress, with the timing, intensity, sector, and type of the investment that was made all playing a role. This stresses the importance of a firm making the right type of investment and choosing the right time and intensity for that investment if it is to withstand a storm in the economic climate. We are, however, aware of aggregation issues, where the deepest insight within an industry remains uncovered.

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Notes

1. These are (1) coalition behaviour theory, (2) gamblers ruin theory, (3) option theory and credit risk theories, (4) cash flow theory, and (5) the income finance theory by Laitinen (2011) and Aziz and Dar (2006).
2. The merchandise sector was left as the base.
3. The period 2008–2010 was left as the base.
4. These were growth of Estonian and Swedish real GDP; average monthly short- and long-term interest rates over a year together with their first differences; yearly change in CPI and highest monthly change in CPI within a year; unemployment level together with its first difference; yearly averages of monthly export expectations of industry players together with biggest monthly change in expectations within a year; change in total retail trade level; change in new passenger car registrations; export-level growth; trade balance to GDP together with its growth level; and food CPI level.
5. The combined effect of the interacted variables was calculated using the STATA lincom procedure.
6. As the obligatory equity level remained constant in 1999–2010, the CPI change meant companies in 1999 were more at risk of breaching the obligatory equity level than companies in 2010. On average the CPI was 1.21×, 1.36×, 1.53×, and 1.95× higher in 2008–2010 than in 2004–2007, 2001–2003, 1998–2000, and 1995–1997, respectively. The estimation results for the period dummies for the same periods were 1.28, 1.40, 1.68–1.69 and 1.20–1.21 which shows that in all the periods except 1995–97 the results for the dummies are similar to the CPI trend. The peculiarity of the 1995–1997 dummy, which didn't show up as statistically significant, can be explained by the fourfold upward shift in the required equity level from 1999, when the required equity level increased from EUR 0.64 thousand to EUR 2.4 thousand for private limited companies and from EUR 6.4 thousand to EUR 24 thousand for public limited companies, and by the legislative changes after the new Commercial Code was introduced in 1995 and the economy started to shift away more vigorously from a soviet-type economy.

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APPENDIX 2. PAPER II

COMPANY PERFORMANCE, INVESTMENT DECISION, AND CYCLICAL SENSITIVITY: A DYNAMIC ESTIMATION ON COMPANY MICRODATA

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The article investigates the endogenous relationships between company investment decisions and performance, given macroeconomic cyclical fluctuations. The research employs annual company-level microdata from the Estonian Business Registry from 1996 to 2010, which encompass two major crisis episodes in 1998–99 and 2008–9. The reverse causality issues are handled with dynamic generalized method of moments (GMM) estimators, and the robustness of the study is backed by multiple definitions of performance as a dependent variable in both the difference and system GMM procedures. The investment decisions of a company are divided into short-term investments in current assets and long-term productivity-enhancing investments in tangible and intangible assets. Several noteworthy patterns are discovered for the impact of a company's investment decisions conditioned on macroeconomic fluctuations in its performance, eventually having an impact on the company's financial strength and sustainability.

The article investigates the endogenous relationships between company investment decisions and performance, given the moderating effect of macroeconomic cyclical fluctuations. The research employs annual company-level microdata from the Estonian Business Registry from 1996 to 2010, which encompass two major crisis episodes in 1998–99 and 2008–9. The reverse causality issues are handled with dynamic generalized method of moments (GMM) estimators, and the robustness of the study is backed by multiple definitions of financial performance as a dependent variable in both the difference and system GMM procedures. The investment decisions of a company are divided into short-term investments in current assets and long-term productivity-enhancing investments in tangible and intangible assets. The study seeks to find evidence on how and how much the type and timing of investment matters for company performance and cyclical sensitivity. Beyond the investment decisions, the firm financing decisions are controlled for, to account for the investment-financing strategy of the firm and its compound effect on firm financial performance. Several noteworthy patterns are discovered for the impact of the company's investment and financing decisions conditioned on macroeconomic fluctuations in its performance, and eventually on the company's financial strength and sustainability.

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This paper is organized as follows. The introduction is followed by the literature survey, and the third section introduces the empirical model. Descriptions of the data and variables and explanations of the research methodology follow in section 4, the results are reported and discussed in section 5, and section 6 concludes. The robustness check is attached in the appendix.

LITERATURE REVIEW

Our research seeks evidence for the compound effects and interactions between company investment[1] and financing decisions under the moderating effect of cyclical fluctuations on firm financial performance. Reverse causality issues emerge in this setting, given the feedback effects between the company's financial standing and its investment-financing strategy conditioned on the state of the macroeconomic environment.

Several parts of this framework have previously been researched and the seminal research by Beaver (1966) and Altman (1968) has paved the way for a vast literature on the determinants of business failure. Comprehensive literature surveys on determinants of firm financial distress have been conducted by Altman and Narayanan (1997), Keasey and Watson (1991), Balcaen and Ooghe (2004), Aziz and Dar (2006), Bellovary et al. (2007), and Ravi Kumar and Ravi (2007), and more recently by Verikas et al. (2010). The theoretical background for financial distress studies usually comes from Beaver (1966) and Taffler's (1983) cash flow theory, both of which view the firm as a set of buffers that are supplied by inflows and drained by outflows, with distress occurring when the buffers are exhausted. Since then, several authors have contributed conceptually and empirically to explaining the determinants of company financial distress given equity or liquidity buffers and the flows toward these buffers. For recent literature reviews, see Aziz and Dar (2006) and Laitinen (2011).

The impact of investment decisions on firm performance and distress likelihood shows mixed evidence. The empirical studies have shown that the probability of a firm's bankruptcy is lowered by higher capital expenditures one year (Gentry et al. 1985a, 52; Aziz et al. 1988, 429; Aziz and Lawson 1989, 57) and four years (Aziz et al. 1988, 429) before failure and higher investment in receivables one year (Gentry et al. 1985a, 52) before failure. All these studies employed information from the US companies' fund flow statements. Gentry et al. (1985b), McKee and Lensberg (2002), and Min and Lee (2005), however, included financial ratios for investments as predictors of company financial soundness and sustainability but did not find statistically significant evidence for them. In contrast, Piramuthu et al. (1998), Park and Han (2002), and McKee (2003) found statistically significant evidence for financial ratios for investment when they used artificial intelligence techniques.

The implications of economic fluctuations for firm financial sustainability and their moderating role has been studied by Johnson (1970), and they suggest that economic conditions play an important role in firm failure prediction. The confirming empirical evidence demonstrating that

[1] Firm investments can be divided into three types: investments in current assets, in fixed assets, and in human capital. In the first two, the investment intensity can easily be derived from standard financial accounts, but the third may be less visible.

the positive macroeconomic cycle lowers firm distress risk has been provided by Richardson et al. (1998), Bhattacharjee et al. (2009), and Christidis and Gregory (2010).

An excellent literature survey of the determinants of company investments is given in Harris and Raviv (1991), Shleifer and Vishny (1997), Hubbard (1998), and more recently Mohamed et al. (2013). The discussion on investment determinants is strongly intertwined with the literature on credit constraints and growth volatility. The arguments and empirical evidence (Aghion et al. 1998, 2010, 2012) for the opportunity-cost approach of modern endogenous growth theory claim that productivity-enhancing investments at the bottom of the cycle lead to growth and productivity gains unless the companies are credit constrained. Barlevy (2007) put forward a theoretical argument accompanied by empirical evidence from the United States that although there is a tendency for procyclical research and development (R&D) to be concentrated in booms, it would be optimal to concentrate R&D in recessions. More recently, Buca and Vermeulen (2012) looked at a sample of European firms and found that profitable investment opportunities have been foregone by bank-dependent firms, which faced credit constraints during the 2009 financial crisis. Ivashina and Scharfstein (2010) and Campello et al. (2011) document heavy credit line drawdowns at the onset of the financial crisis due to firms' concern about the ability of banks to provide liquidity. Schoder (2013) adds to this discussion by studying the relative importance of supply and demand conditions on investment over the cycle. In direct contrast to the financial accelerator literature, he shows that the largest declines in business investment were driven by the demand side of the capital market rather than the supply side, though this does not, however, imply that credit constraints are irrelevant.[2] Männasoo and Meriküll (2014) investigate the relationship between credit constraints and R&D investments in 10 new EU member countries from Central and Eastern Europe and conclude that both the supply effect of credit constraints and the demand effect of firm sales growth are significant determinants of investments that enhance firm productivity. Kane and Richardson (2002) have shown that firms in financial distress are more likely to succeed in a turnaround by contracting their fixed asset base. Flagg et al. (2011) provide confirming evidence that reducing capital expenditures helps to mitigate financial distress, while extending the research scope means they find that the financial decisions taken during distress are not important in determining the success of a turnaround.

Our study contributes to the literature by focusing on the financial performance of companies given the investment and debt flows and their interactions with the cyclical fluctuations.

EMPIRICAL MODEL

The empirical model estimates the company performance as a function of investment and financing strategy at different stages of the economic cycle. Two cycle dummies, one for a downturn and one for a crisis, are included to investigate the cyclical sensitivity of company financials on investment and financing strategy and its timing.

[2] Shroder (2013) also argues that the US monetary/fiscal remedies for maintaining the flow of credit during deep recessions have been successful, whereas the measures aimed at stabilizing aggregate demand have remained insufficient.

$$\begin{aligned} performance = {} & \alpha + \delta_{jt} + u_i + \beta_1 performance_{i,t-1} + \beta_2 Salesgrowth_{i,t} \\ & + \beta_3 DebtInflow_{i,t-1} + \beta_4 DebtInflow_{i,t-1} \times Downturn \\ & + \beta_5 DebtInflow_{i,t-1} \times Crisis + \beta_6 LongInvest_{i,t-1} \\ & + \beta_7 LongInvest_{i,t-1} \times Downturn + \beta_8 LongInvest_{i,t-1} \times Crisis \\ & + \beta_9 ShortInvest_{i,t-1} + \beta_{10} ShortInvest_{i,t-1} \times Downturn \\ & + \beta_{11} ShortInvest_{i,t-1} \times Crisis + \varepsilon_{it} \end{aligned} \quad (1)$$

The α denotes the regression coefficient, δ_{jt} stands for sector j year t fixed effect, u_i is an unobserved time-invariant company fixed effect, and ε_{it}, is a serially uncorrelated error term, which is also uncorrelated with all variables at time $t-1$ but potentially correlated with variables at time *t.* Like Buca and Vermeulen (2012), we include lagged investment in the regression to allow for serial correlation in investment due to installation and adjustment lags, and we also use a similar approach with the debt inflow variables.

DATA AND METHODOLOGY

Data were derived from the Estonian Centre of Registers and Information Systems. The data contained the whole population of Estonian enterprises from four economic sectors—manufacturing, wholesale and retail trade, transportation and storage, and real estate and construction—and covered the period from 1995 to 2010.

In order to exclude the impact of outliers, the 1% lower and upper tail observations were left out of the estimations for ratios based on accrual accounts; due to the discrete nature of the investing, business logic was applied for the investment-related cash flow ratios, where observations showing investment or divestment of more than 100% of the asset size were left out as outliers (see Table 1). The empirical analysis has been conducted on a sample of 19979

TABLE 1
Summary statistics, N = 124,964

Variable	*Mean*	*Std. dev.*	*Min.*	*Max.*
$FS1 = \frac{ROA}{stdev(ROA)}$	0.500	1.010	–13.094	5.535
$FS2 = \frac{ROA+CAR}{stdev(ROA)}$	3.350	1.828	–7.874	11.036
$FS3 = \frac{OCF+CAR}{stdev(OCF)}$	3.392	1.790	0.000	11.181
$FS4 = \frac{OCF}{stdev(OCF)}$	0.540	1.011	–5.152	5.467
$DebtInflow = \frac{DebtInflow}{TotalAssests}$	0.139	14.554	–99.830	97.120
$LongInvestm = \frac{Long\ Investm}{Total\ Assests}$	7.416	17.278	–99.230	99.740
$ShortInvestm = \frac{ShortInvestm}{Total\ Assests}$	3.967	17.861	–99.980	99.330
Sales growth (Y-o-Y)	28.366	114.600	–99.935	1500.000

Definitions of variables: ROA: EBIT Total Assets (%); CAR: Equity Total Assets (%); OCF: EBITDA less change in Working Capital Requirement / Total Assets (%); Debt Inflow Total Assets: change in debt / Total Assets (%); LongInvestm Total Assets: change in tangible assets (excluding land, real-estate investments, and financial investments) Total Assets (%); ShortInvestrn Total Assets: change in Working Capital Requirement Total Assets (%).

companies (76949 observations) using the system GMM estimation and on a sample of 14693 companies (54597 observations) using the difference GMM estimation.

Because the investment decisions are endogenous to company performance and financial strength, the analysis employs the generalized method of moments (GMM) estimators to address the reverse causality issues and also the need to control for the unobserved, time-invariant company-level variables. The GMM estimator has good properties for panels with a short time-dimension (T) and a large number of subjects (N). A linear functional relationship is assumed between the dependent and explanatory variables, where the variable of interest can depend on its own past realizations, allowing for a dynamic estimation. We estimate the empirical models using the dynamic Arellano-Bond (1991) first difference generalized method of moments (FD-GMM) and the two-step system GMM (SYS-GMM) estimator of Arellano and Bover (1995) and Blundell and Bond (1998). The FD-GMM method may suffer from the weak instrument problem, given that the correlations between the differences and the levels of independent variables used as instruments for first differences are small. The SYS-GMM reduces the weak correlation problem, but it requires a "steady-state" assumption throughout the period analyzed, which might barely be satisfied in a transition economy context. Some of the dynamics over the observation period are controlled with exogenous sector-year dummy variables. Both the FD-GMM and SYS-GMM estimators are provided in Table 3. The standard errors are adjusted for heteroscedasticity and autocorrelation and employ the Windmeijer (2005) correction, avoiding the downward bias in finite samples. The GMM estimates with collapsed instruments are reported as suggested by Roodman (2009) to avoid instrument proliferation, leading to overfit of endogenous variables. Because our panel data include gaps, we maximize the estimation sample by using orthogonal deviations instead of first differences. Sector-year dummies reduce possible correlation across individuals' idiosyncratic disturbances and these dummies are treated as exogenous variables in GMM estimations.

In GMM estimations the lagged performance ratio enters the model as an autoregressive endogenous variable instrumented with all its lags and the investment flow ratios, and their interactions with cycle dummies enter the model as predetermined variables instrumented with their third lag. Sector-year dummies are estimated as exogenous variables.

Like Buca and Vermeulen (2012), we divide the economic cycle into three parts, with downturn, crisis, and upturn. The cyclical dummies are defined as year-on-year changes in sector-level value added. The downturn dummy gets the value 1 if growth in the sector's value added decelerates in the next period and the crisis dummy gets the value 1 in 1999 and 2009 as these were the years when growth had decelerated for two or three years in all or most of the sectors and the economy had reached the bottom of the cycle (see Table 2).

RESULTS AND DISCUSSION

The empirical analysis employing the first difference and system GMM estimators was run on multiple definitions of the dependent variable, reflecting the company's performance relative to sector volatility in return on assets, operating cash flows, capital-asset ratios, and combinations of these (see Table 3). The dependent variables serve as proxies for the company's financial performance and are eventually related to company financial strength and sustainability. The first-order autoregressive term is positive and statistically significant throughout the dominating

TABLE 2
Logic for sector cycle dummies and value added in sectors (%)

	1996	*1997*	*1998*	*1999 Crisis*	*2000*	*2001*	*2002*	*2003*	*2004*	*2005*	*2006*	*2007*	*2008*	*2009 Crisis*	*2010*	*2011*
Manufacturing	−0.5	**21.2**	**5.4**	−0.7	**19.9**	**12.9**	7.5	**8.3**	3.0	10.2	**11.2**	**5.0**	**−3.3**	**−23.3**	**26.0**	17.8
Construction	7.9	13.2	**24.5**	−16.2	**24.9**	0.1	**11.7**	**9.7**	8.0	**25.0**	8.3	**11.4**	**3.6**	−34.4	−4.4	31.8
Wholesale and retail trade	**16.1**	**8.9**	**5.6**	2.8	9.6	9.7	**12.8**	7.3	**9.7**	5.2	**15.7**	**6.3**	**−15.0**	−24.0°	−2.9	16.6
Transportation and storage	5.5	**12.8**	6.1	6.1	5.0	**5.3**	−1.7	**10.9**	**9.1**	3.9	**8.0**	**5.1**	**−12.0**	−12.5	−4.4	4.9
Real estate	**9.2**	**8.0**	**6.9**	0.0	**7.2**	**4.1**	**1.8**	**1.0**	0.3	**9.6**	**5.8**	**5.1**	**4.8**	−9.1	2.1	10.1

0.0 Upturn ahead 0.0 crisis (Crisis dummy=1).
0.0 Downturn ahead (Downturn dummy=1).
Source: Statistics Estonia data.

TABLE 3
Impact of investment and debt on financial performance in cyclical fluctuations (measured with cycle dummies), 1996–2010

	FS1 = $\frac{ROA}{stdev(ROA)}$		FS2 = $\frac{ROA+CAR}{stdev(ROA)}$		FS3 = $\frac{OCF+CAR}{stdev(OCF)}$		FS4 = $\frac{OCF}{stdev(OCF)}$	
Financial strength (FS)	*SYS-GMM*	*FD-GMM*	*SYS-GMM*	*FD-GMM*	*SYS-GMM*	*FD-GMM*	*SYS-GMM*	*FD-GMM*
L.FS	0.346***	0.300***	0.610***	0.611***	0.454***	0.514***	–0.026	–0.071
	(0.059)	(0.073)	(0.069)	(0.061)	(0.059)	(0.068)	(0.069)	(0.098)
L.Debt Inflow	–0.026	–0.104	–0.110	–0.217**	–0.014	–0.126*	0.008	–0.085**
	(0.052)	(0.070)	(0.082)	(0.099)	(0.043)	(0.065)	(0.035)	(0.038)
L.Debt Inflow Pre-downturn	0.039	0.142	0.158	0.325**	0.054	0.258**	0.003	0.168***
	(0.072)	(0.103)	(0.120)	(0.144)	(0.072)	(0.103)	(0.054)	(0.058)
L.Debt Inflow Pre-crisis	0.121	0.193*	0.148	0.292*	0.153	0.153	0.099	0.115
	(0.090)	(0.101)	(0.112)	(0.159)	(0.097)	(0.113)	(0.084)	(0.091)
L.Long Investm	0.075***	0.053*	0.066*	0.061	0.064**	0.061	0.081***	0.087***
	(0.024)	(0.029)	(0.037)	(0.056)	(0.031)	(0.038)	(0.027)	(0.027)
L.Long Investo Pre-downturn	–0.067*	–0.052	–0.065	–0.105	–0.072	–0.119**	–0.061*	–0.080**
	(0.036)	(0.043)	(0.055)	(0.072)	(0.046)	(0.054)	(0.037)	(0.039)
L.Long Investo Pre-crisis	–0.019	–0.026	0.041	0.028	–0.046	–0.111	–0.046	–0.102
	(0.054)	(0.061)	(0.071)	(0.117)	(0.064)	(0.144)	(0.063)	(0.093)
L.Short Investm	–0.024	–0.020	–0.083***	–0.111**	–0.059***	–0.041	0.002	0.019
	(0.021)	(0.034)	(0.026)	(0.049)	(0.021)	(0.041)	(0.015)	(0.028)
L.Short Investo Pre-downturn	0.011	0.011	0.095 * *	0.138*	0.084***	0.058	–0.012	–0.043
	(0.031)	(0.049)	(0.040)	(0.077)	(0.032)	(0.065)	(0.023)	(0.043)
L.Short Investo Pre-crisis	0.017	–0.023	0.026	0.005	0.096**	0.054	0.064*	–0.016
	(0.021)	(0.060)	(0.038)	(0.109)	(0.037)	(0.081)	(0.033)	(0.088)
Sales growth	0.004***	0.004***	0.005***	0.005***	0.003***	0.002***	0.002***	0.001***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Hansen	28.684	19.639	27.909	6.382	46.634	18.081	48.153	14.020
Hansen *p*-value	0.232	0.105	0.312	0.931	0.005	0.154	0.004	0.372
ar1	–7.288	–2.483	–3.240	–2.914	–6.881	–3.892	–6.175	–5.302
ar1 *p*-value	0.000	0.013	0.001	0.004	0.000	0.000	0.000	0.000
ar2	–0.743	0.026	–0.069	0.986	1.350	1.007	0.656	–0.237
ar2 *p*-value	0.458	0.979	0.945	0.324	0.177	0.314	0.512	0.813
F	37.923	26.797	35.848	21.447	21.100	12.119	16.846	6.764
F *p*-value	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
j	101	89	102	89	102	89	102	89
No obs	76949	54597	76949	54597	76949	54597	76949	54597
No groups	19979	14693	19979	14693	19979	14693	19979	14693

Source: authors' calculations on Estonian Enterprise Registry data.
Note: Robust standard errors in parenthesis with Windmeijer (2005) correction avoiding the downward bias in finite Samples. Sector-year dummies and constant term included. ***, **, * represent statistical significance at the levels of 1%, 5%, and 10%, respectively.

part of the estimations. This result is consistent with the expectations, suggesting that past performance is positively correlated with current performance. The autoregressive coefficients picking up persistency in company performance are lower for the FD-GMM estimations than for the SYS-GMM results, as expected.

Sales growth, capturing the ability of the firm to generate internal cash flows, has an anticipated positive and significant impact upon company performance in all the regressions. Because the average volatility of the return on assets ratio (ROA) is 20%, the results imply that a 5% increase in sales growth ratio improves the ROA by about 0.5%.

Interestingly, debt inflows have a negative impact on company performance before the cyclical upturn, but have a positive, supportive effect on company financials at the onset of the downturn and crisis. Moreover, the coefficients for the debt inflow and crisis interaction terms are stronger than the interaction terms with the downturn dummy. This implies that liquidity and financing become bigger concerns as the economic outlook worsens. Both results are in agreement with evidence provided by Akbar et al. (2013). This finding proves the rationale for debt frontloading documented by Ivashina and Scharfstein (2010) and Campello et al. (2011), providing evidence of heavy credit line drawdowns at the onset of the financial crisis due to concerns among firms about the ability of banks to provide liquidity, which might lead to temporary credit being taken beyond the optimal amount for investment. The access to debt before the economic and credit contraction might improve the company's outlook for better utilization of its capacities and enable it to restructure during the period of hardship.

Long-term investments have a predominantly positive and significant impact on company performance at the outset of the cyclical upturn, suggesting that investments in productivity enhancement have the highest payoffs during the economic peak. This evidence is supported by the theoretical arguments and empirical results provided by Barlevy (2007). The evidence supports the arguments of the opportunity-cost approach of modern endogenous growth theory (see Aghion et al. 2010), which claims that long-term productivity-enhancing investments at the bottom of the cycle lead to growth and productivity gains. The positive effect from long-term investments upfront in the economic upturn ranges from 5.3% to 7.8% in ROA given a 5% increase in long-term investments relative to total assets. However, the results show that long-term investments made at the peak or before the cyclical drop have a detrimental effect on firm financials and account for a drop of about 7% in ROA, which corresponds to a 5% pre-downturn increase in long-term investments, meaning expansion in the wake of a downturn is not beneficial for a company's financial strength. Kane and Richardson (2002) and Flagg et al. (2011) have shown that firms in financial distress are more likely to succeed in turning themselves around by reducing capital expenditures.

The empirical insights for short-term investments imply contrasting evidence to that from long-term investments, with a negative investment effect at the onset of the upturn and some positive effect at the onset of the downturn. Hence, the cyclicality of short-term and long-term investments has a very different pattern, and these results are broadly in line with results of Maripuu and Männasoo (2015), who demonstrate the cycle sensitivity of working capital investments and long-term investments, where long-term investments had a significant positive effect on firm sustainability in the wake of the cyclical upturn.

For robustness purposes (see Appendix A: Robustness Check) the baseline estimations were checked for the impact of the magnitude of the cycle (see Table Al) and for the investment-financing setup at different cyclical phases (see Table A2). Both exercises confirm the main

results, stressing the importance of credit access at the onset of the cyclical downturn and the crisis along with higher investment risks in the wake of the cycle downturn.

CONCLUSIONS

In general, the results reveal interesting cyclical patterns, indicating the risks and challenges in investment and the financing strategy of a company. Credit constraints seem to have an important role for firm performance and sustainability, as those companies able to get financing at the onset of the downturn and crisis are in a better position than credits-constrained firms. The investment-cycle patterns show that productivity-enhancing long-term investments improve firm performance, conditioned on a positive economic outlook, but they elevate the risks at the onset of the downturn. However, the implications for short-term investments do not share the patterns observed for the long-term investments. The timing of investments is critical for firm performance, because both the long-term and short-term investments are cycle sensitive and may have a negative effect on firm financials, depending on the investment timing relative to the economic cycle.

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APPENDIX A: ROBUSTNESS CHECK

The current section addresses the robustness of the main results presented in Table 3. First, it is possible that the magnitude of the cycle (its depth or the height of its peak) has an important effect on the cycle-flow interaction coefficients. To check this, we have replaced the zero-one cycle dummy variables with continuous measures for the cyclical upturn, downturn, and crisis variables ranging between zero and the magnitude of the upturn, downturn, or crisis (see Table Al). The coefficient signs and the magnitudes remain unchanged from the main estimation results, which proves that the magnitude of the cyclical fluctuations does not alter our results or conclusions.

Further interest may lie in the investment-debt decision of a company or whether the investment-financing setup has an impact on company performance in cyclical fluctuations. To limit the number of dummy variables and to avoid possible accounting discrepancies in separating the tangible and the current assets, all investments (long-term and short-term) are considered as a single variable. To account for the investment-financing decisions of the company, the dummy variables were defined as a positive investment flow with an accompanying debt inflow, a positive investment flow without debt inflow, and no positive investment flow. The first dummy captures investments made with external finances, the second indicates investments from internal resources, and the last denotes that the investment was not made. If the dummy of "no investment" enters the base category, the results of the system GMM estimations (see Table A2) suggest that investments upfront in the cyclical upturn have a strong positive effect on the company's performance, whereas the investments financed by the company's internal resources and cash flows lead to even higher benefits than do debt-financed investments. The pre-downturn investments have negative coefficient signs, and significantly so for the internally financed investments. This result is in line with the baseline estimations (see Table 3), conveying the significant negative effect of credit constraints and investment risks at the onset of the cyclical downturn. The highest returns on investment, however, are earned by companies investing at the bottom of the cycle while having access to external finance during the trough of the crisis. The extremely high coefficients suggest about 2.5 times higher ROA than for companies that are not able to invest or to get external finance for investing at the cycle

TABLE A1
Impact of debt and long-term investments on financial performance in cyclical fluctuations (measured with continuous cycle variable), 1996–2010

	$\frac{\text{ROA}}{\text{stdev(ROA)}}$		$\frac{\text{ROA+CAR}}{\text{stdev(ROA)}}$		$\frac{\text{OCF+CAR}}{\text{stdev(OFC)}}$		$\frac{\text{OCF}}{\text{stdev(OCF)}}$	
Financial strength (FS)	*SYS-GMM*	*FD-GMM*	*SYS-GMM*	*FD-GMM*	*SYS-GMM*	*FD-GMM*	*SYS-GMM*	*FD-GMM*
L.FS	0.261***	0.281***	0.545 * **	0.570**	0.485***	0.565***	−0.001	−0.041
	(0.050)	(0.063)	(0.066)	(0.044)	(0.057)	(0.065)	(0.066)	(0.116)
L.Debt Inflow	0.017	−0.016	−0.017	−0.092	−0.007	−0.054	0.002	−0.057
	(0.022)	(0.040)	(0.030)	(0.068)	(0.029)	(0.050)	(0.021)	(0.035)
L.Debt Inflow Pre-downturn	−0.006	0.006	0.003	0.035*	0.015	0.036**	0.011	0.031**
	(0.007)	(0.012)	(0.011)	(0.021)	(0.011)	(0.017)	(0.008)	(0.013)
L.Debt Inflow Pre-crisis	−0.017	0.001	0.051	0.205	0.010	0.167	−0.046	0.105
	(0.050)	(0.094)	(0.082)	(0.161)	(0.086)	(0.116)	(0.058)	(0.078)
L.Long Investm	0.032***	0.023*	0.041***	0.010	0.042***	−0.008	0.055***	0.041**
	(0.010)	(0.013)	(0.013)	(0.025)	(0.016)	(0.024)	(0.014)	(0.017)
L.Long rhvestm.Pre-downturn	−0.002	−0.001	−0.002	−0.007	−0.007**	−0.011***	−0.007***	−0.006*
	(0.003)	(0.003)	(0.003)	(0.004)	(0.003)	(0.004)	(0.003)	(0.004)
L.Long Investm Pre-crisis	0.079	0.006	0.007	−0.031	−0.055	−0.029	−0.001	0.010
	(0.052)	(0.061)	(0.065)	(0.062)	(0.063)	(0.051)	(0.059)	(0.047)
L.Short Investm	−0.000	−0.008	−0.027**	−0.027	−0.010	0.008	−0.000	0.005
	(0.009)	(0.013)	(0.013)	(0.017)	(0.011)	(0.016)	(0.009)	(0.015)
L.Short Investm Pre-downturn	−0.002	−0.002	0.001	−0.003	0.001	−0.006	−0.001	−0.005
	(0.002)	(0.004)	(0.003)	(0.005)	(0.003)	(0.004)	(0.002)	(0.004)
L.Short Investm Pre-crisis	−0.022	0.006	0.046	0.079	0.070*	0.053	−0.002	−0.015
	(0.032)	(0.035)	(0.043)	(0.051)	(0.040)	(0.046)	(0.028)	(0.043)
Sales growth	0.004***	0.004***	0.005***	0.005***	0.003***	0.003***	0.002***	0.002***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Hansen	45.171	24.894	52.794	17.534	44.790	19.830	46.109	10.779
Hansen *p*-value	0.006	0.024	0.001	0.176	0.009	0.100	0.006	0.629
arl	−6.481	−6.095	−12.407	−2.473	−5.476	−3.504	−6.235	−3.440
arl *p*-value	0.000	0.000	0.000	0.013	0.000	0.000	0.000	0.001
ar2	−1.570	−0.942	−1.193	−0.252	1.010	1.222	−0.055	−0.651
ar2 *p*-value	0.116	0.346	0.233	0.801−	0.313	0.222	0.956	0.515
F	34.884	32.091	41.522	25.369	22.709	15.145	17.837	6.649
F *p*-value j	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
J	101	89	102	89	102	89	102	89
No obs	76949	54597	76949	54597	76949	54597	76949	54597
No groups	19979	14693	19979	14693	19979	14693	19979	14693

Source: Authors' calculations on Estonian Enterprice Registry data.
Note: Robust standard errors in parenthesis with Windmeijer (2005) correction avoiding the downward bias in finite samples. Sector-year dummies and constant term included. ***, **, * stand for 1%, 5%, and 10% level statistical significance, respectively.

TABLE A2
Impact of debt and investments on financial performance over the business cycles with categorical measures, 1996–2010 (System GMM estimation)

Financial strength (FS)	$\frac{\text{ROA}}{\text{stdev(ROA)}}$	$\frac{\text{ROA+CAR}}{\text{stdev(ROA)}}$	$\frac{\text{OCF+CAR}}{\text{stdev(OFC)}}$	$\frac{\text{OCF}}{\text{stdev(OCF)}}$
L.FS	0.010	0.180**	0.134*	−0.008
	(0.082)	(0.090)	(0.078)	(0.063)
L.Debt Invest	4.942***	0.773	−1.891	2.258**
	(1.288)	(1.504)	(1.306)	(0.988)
L.NoDebt Invest	5.450***	3.334*	1.289	3.034**
	(1.564)	(1.788)	(1.561)	(1.201)
L.Debt Invest Pre-downturn	−1.057	0.883	1.245	−0.416
	(1.162)	(1.333)	(1.152)	(0.892)
L.NoDebt Invest Pre-downturn	−3.398**	−3.969**	−2.704**	−1.764*
	(1.322)	(1.552)	(1.356)	(1.014)
L.Debt Invest Crisis	13.952**	20.852***	21.864***	11.990***
	(5.480)	(6.118)	(5.380)	(4.284)
L.NoDebt Invest Crisis	−4.309	2.908	6.556	−0.289
	(4.513)	(4.971)	(4.395)	(3.608)
dsale	0.004***	0.004***	0.002***	0.002***
	(0.000)	(0.000)	(0.000)	(0.000)
Hansen	15.741	53.736	59.860	10.468
Hansen *p*-value	0.203	0.000	0.000	0.575
ar1	−4.136	−3.919	−4.470	−3.800
arl *p*-value	0.000	0.000	0.000	0.000
ar2	1.301	−0.009	0.610	−2.460
ar2 *p*-value	0.193	0.993	0.542	0.014
J	86	86	86	86
No obs	76949	76949	76949	76949
No groups	19979	19979	19979	19979

Source: Authors calculations on Estonian Enterprice Registry data.
Note: Systen GMM estimations. Robust standard errorsjn parenthesis with Windmeijer (2005) correction avoiding the downward bias in finite samples. Sector-year dummies and constant term included. ***, **, * stand for 1%, 5%, and 10% level statistical significance, respectively.

bottom. The Hansen test indicates nonvalid instruments for the system-GMM results for two dependent variable definitions out of four, meaning for dependent variable definitions that have the capital-asset ratio in the nominator. Because the capital-asset ratio is a stock measure and not a flow measure, the high persistency of the ratio turns the instruments invalid. Hence, the coefficients should be interpreted with caution for those estimations that do not pass the Hansen test for instrument validity.

APPENDIX B

TABLE B1
Summary statistics by sectors

Variable	*Mean*	*Std. dev.*	*Min.*	*Max.*
Manufacturing, N = 28 145				
FS1	0.480	1.011	−13.094	4.447
FS2	3.358	1.749	−7.874	9.366
FS3	3.601	1.761	0.000	9.976
FS4	0.603	1.007	−5.101	4.912
Debt-Inflow	0.151	13.370	−98.820	86.800
Long Invest.	8.511	16.293	−95.340	99.020
Short Invest	3.441	17.258	−99.500	98.110
Sales growth	23.902	93.729	−99.683	1500.000
Merchandise, N = 51 817				
FS1	0.508	1.005	−7.946	5.251
FS2	3.363	1.895	−4.526	10.162
FS3	3.316	1.869	0.000	11.181
FS4	0.437	1.002	−5.152	5.467
Debt .Inflow	0.016	13.239	−99.830	94.150
Long Invest	4.963	14.243	−99.230	98.420
Short Invest	4.720	18.034	−99,980	99.190
Sales growth	23.411	102.455	−99;935	1500.000
Hotels and Restaurants, N = 6 101				
FS1	0.319	1.000	−7.187	4.529
FS2	3.108	1.786	−5.075	9.247
FS3	3.263	1.714	0.001	9.265
FS4	0.522	1.007	−4.689	4.575
Debt Inflow	−0.839	17.333	−93.850	89.910
Long Invest	7.987	19.716	−94.010	97.960
Short Invest	2.335	17.249	−98.700	97.920
Sales growth	18.345	86.767	−97.207	1500.000
Transport and storage, N = 13 118				
FS1	0.531	1.004	−8.465	4.670
FS2	3.431	1.791	−4.419	9.701
FS3	3.558	1.736	0.001	9.684
FS4	0.783	1.006	−4.430	4.638
Debt Inflow	1.036	18.833	−97.590	92.180
Long Invest	13.499	22.674	−98.530	99.700
Short Invest	3.448	16.220	−98.620	93.850
Sales growth	34.427	120.009	−98.180	1485.714
Construction and real estate, N = 24 696				
FS1	0.540	1.021	−8.582	5.535
FS2	3.372	1.792	−4.813	11.036
FS3	3.278	1.664	0.003	9.494
FS4	0.566	1.008	−4.781	4.192
Debt Inflow	0.131	15.020	−97.240	97.120
Long Invest	8.036	19.055	−97.600	98.840
Short Invest	3.667	18.973	−99.240	99.330
Sales growth	42.646	154.028	−99.674	1500.000

Notes. See definitions of variables from footnote of Table 1.

APPENDIX 3. PAPER III

INVESTMENTS, CREDIT AND COMPANY DISTRESS: EVIDENCE FROM CENTRAL AND EASTERN EUROPE

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Investments, Credit, and Corporate Financial Distress: Evidence from Central and Eastern Europe

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ABSTRACT: Although they are instrumental for economic development, productivity enhancing corporate investments may increase the financial vulnerability of companies, especially in an economic and financial crisis. We employ an instrumental probit model with the aim of finding evidence for the investment and credit patterns that led companies into financial distress during the global financial crisis 2009-2010. The company level micro-data for our study on three Central and East European countries – Hungary, Bulgaria, Romania

and two Baltic countries – Latvia and Lithuania – originates from two independent surveys, the Business Environment and Enterprise Performance Survey conducted in 2008 and the Financial Crisis Survey conducted in 2009/2010. Both were carried out jointly by the EBRD and the World Bank. Our results emphasize a substantial adverse impact from investment intensity and debt financing on company financial soundness during a crisis. On top of that, we discover a strong non-linear pattern in the sensitivity of company distress to its investment-financing nexus.

KEYWORDS: investments, credit, corporate financial distress, Central and Eastern Europe, economic crisis

Introduction and background

Corporate investments are instrumental for productivity improvement and industry competitiveness. Syverson (2011) documents robust empirical evidence on positive correlation between higher productivity and corporate survival across countries, time-periods and industries. At the company level however, investments present not only opportunities but also significant risks. Debt repayments on investments funded with external financing put a pressure on the company's cash flows, but there might be a considerable time-lag before productivity gains from the investments emerge, and in the worst case the investments may have a negative return. Furthermore, investments tend to increase the operational costs of installing, operating and maintaining new technology or production equipment. Although investment is overall expected to increase the productivity, competitiveness and profitability of a company, it may cause its financial position to suffer, especially during the setup phase.

However, the financial vulnerability of a company not only depends on its investment and credit decision but is also strongly intertwined with the broader economic and financial environment. The macroeconomic climate tends to have a strong influence on companies' investment and credit decision *ex ante*, and it plays a critical role in the success and profitability of the investments *ex post*. While excessive risk aversion towards investment hinders company competitiveness and growth from enjoying positive scale effects, and overly optimistic stance may lead to overinvestment and low or even negative returns. Both of these are undesirable market frictions that might be alleviated with appropriate policy measures. Our study seeks to find evidence for what the impact of investment and the credit profiles of companies was and on whether they became financially distressed in the trough of the financial recession in 2009-2010.

Determinants of corporate financial distress have received extensive coverage in the literature. For comprehensive surveys, see e.g. Balcaen and Ooghe (2006), Aziz and Dar (2006), Bellovary et al. (2007), and Altman et al. (2014). As expected, many researchers have demonstrated that macroeconomic downturns tend to increase the risk of company failures. Richardson et al. (1998) base their theoretical argument on Beaver's (1966) model, which stresses the importance of a liquidity buffer for company survival, and they argued that weaker demand induced by a recession reduces companies' internal cash flows, and a possible credit crunch hampers the access of credit-constrained companies to external cash flows, thus increasing the risk of financial distress. Bhattacharjee et al. (2009) have formulated a competing exit risks model, in which one outcome is that company exits are low in stable macroeconomic environment and high during a recession because the total pool of investors and available investment financing is contracting at that time.

Another stylized fact is that company size and age play an important role in whether a company becomes distressed. Several studies have reported empirical evidence that small companies are more prone to risk of financial distress (see e.g. Ohlson, 1980; Bickerdyke et al., 2000; Tsai 2013). Dunne and Hughes (1994) explain that this is because the scale effect is insufficient. Thornhill and Amit (2003), building on a resource-based view of operating a company, argue that young companies are at risk because they lack valuable resources and capabilities, while older companies may fail because they are unable to adapt to a changing competitive environment. Moreover, Hazak and Männasoo (2010) find that the risk of default appears as a U-shaped function of the time the company has survived, meaning that financial vulnerability tends to decrease as a company establishes itself in the market, but returns upwards as the company ages as exposure to internal problems and external shocks accumulates.

Although several authors have included investment related variables in their financial distress models, empirical evidence about the effect of higher capital investment volumes on company financial distress remains mixed. Some studies report a strong positive relationship (e.g. Gentry et al., 1985a; Aziz et al., 1988; Aziz & Lawson, 1989) while others have found no support for that (Gentry et al., 1985b; McKee & Lensberg, 2002; Min & Lee, 2005 among others). Long-term capital investment appears to improve company performance when there is a positive economic outlook, while investments elevate risks at the onset of a downturn (Männasoo and Maripuu 2015). Kane and Richardson (2002) have found companies that are already distressed to have a better chance of recovery if they contract their extant asset base, while Flagg et al. (2011) see a reduction in capital expenditure together with an increase in R&D spending as a way out of distress.

The literature on the determinants of the financing of investments has emphasized the crucial role played by the extant structure of cash flows and credit constraints – see Harris and Raviv (1991), Shleifer and Vishny (1997) and Hubbard (1998), or more recently Mohamed et al. (2013) for excellent literature surveys.

Theoretical arguments by Aghion et al. (2010, 2012) suggest that countercyclical R&D and other productivity enhancing investments are justified unless the company is credit constrained. In their theoretical model, a company facing an internal cash flow shock becomes more credit constrained because its ability to provide collateral worsens along with the internal cash flows, and this in turn reduces its ability to invest. Barlevy (2007), in contrast, argues that the procyclical nature of R&D investments stems from a dynamic externality inherent to R&D, making entrepreneurs short-sighted so that they concentrate their innovation in boom times.

Campello et al. (2011) looked into the interaction between the investment decisions of companies and their internal and external liquidity in the 2009 crisis, finding that credit constrained companies appeared to substitute internal liquidity with external credit lines in order to make investments during the crisis.

Popov (2014) documents the negative effect of credit constraints on human capital investments and shows that this effect is stronger in education-intensive industries and in industries facing good global growth opportunities. Avarmaa et al. (2013) demonstrate the effects that financial leverage and credit constraints have on labour productivity. Tian and Wang (2014) moved forward and showed that lower credit constraints in the form of failure-tolerant investors lead to higher *ex post* innovation productivity in venture capital backed start-up companies and more so for ventures born during recessions.

The adverse effect of credit constraints on capital investments (see e.g. Fazzari et al., 1988; Li, 2011) has found strong empirical support. Moreover, credit constraints particularly appear to restrain investments in small and young companies (see e.g. Hadlock and Pierce, 2010; Saeed and Vincent, 2012) and in domestic companies, more so than in foreign ones (Gorodnichenko and Schnitzer, 2013). Schoder (2013) adds to the discussion on the cyclical sensitivity of investments by stressing the importance of patterns of supply (i.e. cost of finance and access to it) and demand (i.e. investment opportunities) conditions. He shows that investment has been driven by the demand side rather than the supply side of capital markets during the most severe recession.

In the CEE context, Nivorozhkin (2005) has shown that leverage is significantly associated with country and industry effects, and is positively related to the share of private credit to GDP. Črnigoj and Verbič (2014) showed that corporate investments in Slovenia were significantly affected by financial constraints during the global financial crisis. Avarmaa et al. (2011) find that size has a positive effect and age a negative one on the leverage of Baltic companies and that multinational companies tend to be less credit constrained in economic downturns. Beyond the broad-based evidence that liquidity, leverage, and profitability ratios form a robust set of firm distress predictors Maripuu and Männasoo (2014), based on Estonian companies data, show that companies distress risk varies in economic cycle and investment intensity.

Our study contributes to the literature by investigating how the combination of investment intensity and debt financing affects a company's distress in an adverse economic environment. In doing so the key methodological challenge is to address the non-linearity and endogeneity issues that arise from a limited dependent variable and explanatory variables likely to be correlated with the error term.

Gorodnichenko and Schnitzer (2013) tackled the endogeneity problem in their study on determinants of innovation activity by using instrumental variable estimators. Schoder (2013) and Männasoo and Maripuu (2015) use the General Method of Moments (GMM) estimator, which allows them to obtain consistent parameter estimates. We apply instrumental variable estimators to identify the effects of investment intensity and external debt upon company distress by using two independently conducted surveys where the same companies were questioned both before and after the start of the financial crisis in 2009 /2010. Beyond that, we employ both linear (2-Step-Least-Squares and Limited Information Maximum Likelihood methods and GMM) and non-linear (2-step Probit and Maximum Likelihood Probit) instrumental variable methods.

The paper is organized as follows. The introductory section is followed by the descriptions of the data and the research methodology in Section 2. Then the results are reported and discussed in Section 3, and Section 4 concludes.

Data and methodology

The company level data for our study originate from two surveys – the fourth wave of the Business Environment and Enterprise Performance Survey (BEEPS) and all three waves of the Financial Crisis Survey (FCS), both conducted jointly by the European Bank for Reconstruction and Development (EBRD) and the World Bank Group (World Bank) in 2008/2009 and 2009/2010, respectively. In addition, we have used macroeconomic statistics from Eurostat and EBRD.

The BEEPS was conducted in five waves in 1999-2014 and it covers 30 transition countries. The FCS was conducted in three waves over 2009-2010 on a sub-selection of the companies that had been interviewed for the fourth wave of the BEEPS, and it covers six countries. For

our study we have excluded Turkey and used data for five EU member countries Bulgaria, Latvia, Lithuania, Hungary, and Romania as a more homogeneous sample. We can argue (see e.g. Gorodnichenko and Schnitzer, 2013) that these were the European countries hit hardest by the recent financial crisis. Figures from Eurostat show the average decline in GDP in 2009 in these six countries was higher than the average of 4.5% for the European Union of 28 countries, as GDP declined by 5.5% in Bulgaria, 6.8% in Hungary, 17.7% in Latvia, 14.8% in Lithuania, and 6.6% in Romania. We chose these specific waves of the surveys so that we could focus on two distinct episodes – the height of the economic upswing in 2007 and the effect of the financial crisis in 2009/2010. Figure 1 shows that the first negative effect of the global financial crisis on gross value added was seen in late 2008 and early 2009, while there were significant variances in the depth of the crisis between the countries, and the bottom was reached at different times. Private sector credit to GDP was following a path of growth at the end of 2008, and no visible deleveraging happened before 2010.

[Table 1 somewhere here]

[Figure 1 somewhere here]

Our dataset covers companies from 18 sub-industries (NACE 2), of which 11 are manufacturing sub-industries and three are in wholesale and retail trade, while the others are transportation and storage, construction, hotels and restaurants, and information technology. The sample structure of the BEEPS and the FCS was designed to be representative of the population of companies in each country by using stratified random sampling. These surveys did not include companies with fewer than two or more than 10,000 employees, nor companies with 100% government ownership and companies from highly regulated sectors, such as financial activities, utilities, mining, and rail transport. We have additionally excluded

all firms with 50% or higher government or state ownership and firms with payments overdue by more than 90 days according to the pre-crisis BEEPs survey.

Both the BEEPS and the FCS comprise self-reported measures of companies' investments, credit constraints and financial distress. For a short description of the variables used for our study, together with the source of data and descriptive statistics, see Table 1. From the estimation sample of 1106 companies, 62% had made an investment in PPE during 2007 and 29% had used either bank credit or trade credit to finance their investments. The descriptive statistics broken down by companies distress status and by countries are to be found from online Supplementary Material S2, available online (see Table S5).

[Figure 2 somewhere here]

Moreover, the kernel density estimations see Figure 2 reveal that those companies which had not financed investments with external credit before the economic crisis nor made any investments were less subject to financial distress, especially the non-investing companies. The solid line representing distressed companies shows the higher probability mass at higher levels of debt financing (LTC), as well as at higher levels of investment intensity (ITS_{PPE}).

[Figure 3 somewhere here]

Next, we look closer into the financing structure of investments into property, plant and equipment (PPE), outlining equity financing (share capital and retained earnings), bank debt, trade credit (payables to suppliers and advances from customers) and other sources of financing (e.g. non-bank-debt). The financing structure on Figure 3 is shown separately for distressed and non-distressed firms (non-weighted mean) for total sample (left graph) and by countries (right graph). The sample overall structure implies a higher internal funding share (68%) for the group of non-distressed companies relative to the group of distressed

companies (54%), whereas the bank financing had an opposite pattern with 24% for non-distressed and 36% for distressed companies. Trade credits had an about equivalent share of 5% in both company groups. The distressed companies had also higher share of "other financing", but the overall share of this source of funding remained low in both groups (3% for non-distressed and 5% for distressed group). The sample overall financing structure is coherent in all five countries, with distressed companies being more exposed to external financing compared to non-distressed firms.

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The effects of investment intensity and gearing on distress probability are estimated with an instrumental variable probit model. Like Gorodnichenko and Schnitzer (2013), we have chosen to use the instrumental variables method instead of simple linear (Ordinary Least

Squares) or non-linear estimators (probit or logit) to avoid inconsistent parameters caused by highly endogenous relationships between investments intensity, investments leverage and distress probability. The endogeneity mainly stems from *ex ante* stronger (weaker) companies investing and borrowing more (less) *ex post*.

To define our dependent variable of company distress we use the FCS data only, whereas all company level explanatory variables were retrieved from the pre-crisis BEEPS dataset. Additionally, we exclude companies, which reported overdue payments of taxes and utility costs before the crisis in the BEEPS survey, in order to exclude the effect of those companies, that were already in trouble before the crisis and might hence distort the predetermined nature of our explanatory variables.

$$Distress_{isc,t} = 2009/2010 = \Phi(\beta_0 + \alpha_0 ITS_{isc,t=2007} + \alpha_1 LTC_{isc,t=2007} + \beta_1 Age_{isc,t=2007} + \beta_2 Size_{isc,t=2007} + \beta_3 SectorVA_{isc,t=2009} + \varepsilon_{isc,t})$$

Our baseline estimator is the instrumental variable probit (IV Probit) model, where Φ denotes the cumulative standard normal probability distribution function. The parameters α_0 and α_1 denote our key explanatory, but endogenous variables, investment to sales (ITS) and loan-to-cost (LTC), both of which have been instrumented with country and sector dummies, the country credit-to-GDP ratio in 2007, and the 2007 share of employees holding a university degree. The country and sector effects and the proportion of employees with a university degree are significantly associated with investment intensity and external debt funding of investments in reduced-form equation constituting relevant instruments. The relevance of our instruments is in line with Nivorozhkin (2005) and Popov (2014) who stress the macroeconomic and human capital influences on capital structure and financing choices. The instruments are uncorrelated with the outcome variable or company distress probability and thus excluded from the structural equation. The validity of instruments is confirmed by

overidentification tests, see results diagnostics in Table 2. The subscripts i = 1…1106, s = 1…6, c = 1…5 and t = 2007, 2009/2010 denote firms, industries, countries, and years respectively.

We present our baseline non-linear instrumental variable full maximum likelihood probit estimates and two-step probit estimates along with the linear (2SLS, LIML and GMM) estimates in Table 2 to enable some comparison and allow robustness checks across the results. The stronger outcome of the non-linear IVprobit model explicates the importance of considering the non-linearity of the dependent variable or the distress variable with respect to the covariates. The marginal effects of IV Probit at varying levels of investment and external debt financing of investments are outlined in Figure 4 and Figure 5. The overidentification tests are provided along with the model estimates, and these confirm the validity of our instruments. A number of robustness checks are conducted to validate our baseline results and these are available as the Supplementary Material online.

Results

We find that both higher pre-crisis investment intensity and higher debt financing of investments increase the probability of a company facing distress in the aftermath of the crisis. The linear estimators (2SLS and GMM) show that a 10% increase in investment intensity, measured by the investments to sales ratio, results in an increase of 12-14% in the probability of the company being financially distressed (see Table 2). A 10% increase in the share of bank loans in the financing of new investments increases the probability of company distress by 8%. Compared with those of previous studies, our results are in line with the findings of Kane and Richardson (2002), who documented how reducting capital expenditures has a positive effect on a company's ability to recover from financial distress, and those of Männasoo and Maripuu (2015), who showed that expansion of investment in the

wake of a downturn is detrimental for a company's financial strength. We explore the related issues in a country comparative context under the adverse economic conditions during the global financial crisis in 2009-2010.

[Table 2 somewhere here]

The strongest determinant of company viability is its size, as companies with more than 50 employees are 12% less likely to encounter financial distress in our pooled sample. Although company size has been widely reported in the previous literature as an important determinant of survival (see e.g. Ohlson, 1980 and Tsai 2013), we show that company size plays a varying role at different stages of crisis being more significant in buffering the firm against crisis at the beginning of downturn, while becoming less important factor of resilience (if not a trigger of crisis) in longer-term. Company age to the contrary becomes a significant remedy to crisis only in the later stages of downturn. The advantage of established firms in coping with the crisis might stem from stronger managerial experience and more deep-rooted relationships with their suppliers and customers. To control for possible U-shape relationship, in line with Hazak and Männasoo (2010), we added squared effect of age into the model, but this step did not change our baseline results.

Investment gearing was a more detrimental factor at the beginning of the crisis, whereas the investment intensity became a significant cause of distress only after a prolonged period of adverse economic environment (see Table 3). The pattern of how firms reflected on crisis shows that at the early stages of crisis the first to become distressed are the small companies with high investment gearing. As the crisis evolves the size of the company becomes irrelevant if not a further trigger of distress for the companies with high pre-crisis investment intensity. The underutilized tangible and human capacities become a financial burden for the companies in a low demand environment of the crisis.

[Table 3 somewhere here]

The non-linearity of the instrumental probit model (IVprobit) turns the coefficients interpretation into a non-trivial task. Therefore the main results of the paper are depicted on graphs Figure 4 and Figure 5, which illustrate the probability of distress at different investment and dept levels, and marginal effects at varying investment and debt levels, respectively. Companies which use equity financing for new investments exhibit an almost linear positive relationship between investment intensity and distress (see upper left panel of Figure 4). For those companies that use debt to finance new investments, the relationship between investment intensity and distress appears non-linear. Investment intensity plays a crucial role in increasing the probability of distress at low or zero debt levels, whereas the incremental negative effect appears to diminish at higher levels of debt. This is further affirmed by the marginal effects exhibited on Figure 5, showing that, up to a certain turning point, additional investments by both low-leverage and no-leverage companies tend to accelerate the probability of the company becoming financially distressed, but if investments are made in relatively large volumes, they do not magnify the probability of distress that each additional unit of investment adds, but rather they decelerate growth in it.

[Figure 4 somewhere here] [Figure 5 somewhere here]

The shape of the relationship between a company's investment intensity and its financial viability can be different depending on the extent of debt financing used for new investment. The more leveraged the investment financing is, the stronger the deceleration in the growth in the probability of distress beyond a certain turning point in investment intensity. Decelerated distress probability is also reflected in marginal effects which are monotonously decreasing in investment intensity for leveraged firms. The firms using own financing to the contrary show marginal effects which peak at the annual investment level of 30% dropping thereafter.

Conclusions

In this paper, we have disentangled the effects that pre-crisis investment intensity and the extent of debt financing had on company financial soundness in the aftermath of the global financial crisis of 2009/2010. Our study employs company level data in a country comparative perspective of five Central and Eastern European countries - Bulgaria, Hungary, Latvia, Lithuania and Romania.

Our contribution is twofold. Firstly, we demonstrate a robust positive association between company financial distress and investment intensity, along with an intertwined effect with the extent of external financing used for the investments. Secondly, we show multiple nonlinear relationships regarding distress probability and marginal effects at different levels of debt and investment. Like earlier literature, we find support for the positive impact of a company's size on its sustainability in our pooled sample, however, looking at different stages of the crisis the company size increases resilience to crisis only at the onset or beginning of downturn in 2009, whereas its effect disappears or even reverses in later phases of the crisis in 2010. Though the age of the company was insignificant in explaining distress in pooled sample, its effect turned significant and negatively related to distress hazard only in later stages of crisis in the 2010 survey wave. The overall pattern shows that the first to be hit by the crisis are the small, highly geared companies followed by newly established firms which have made considerable investments pre-crisis.

Contrary to the conventional understanding, additional externally financed investments dampen the marginal hazard of financial distress. The higher the leverage in the investment financing, the stronger the decay in marginal effect upon the probability of distress. This implies that highly leveraged companies need to keep up high levels of investments in order

to enhance productivity and generate revenues for maintaining and growing the business and serving the debts.

Our study stresses that the vulnerability of companies to the adverse economic environment in the aftermath of the Global financial crisis in 2009/2010 was driven by their pre-crisis investment and financing decisions. The larger the pre-crisis investments and debts were, the higher the company's probability of financial distress during the crisis turned out to be. Policy measures that encourage sustainable levels of investment and debt, and potentially provide support during a crisis to companies that have a sound investment and financing strategy, might alleviate some of the adverse effects of a crisis and promote more forward-looking financial decisions at the company level.

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Table1.

Name	Description [Unit]	Source	Mean	Std.Dev	Min	Max	N
Outcome variable							
Company Distress	1, if company has filed for insolvency (or bankruptcy), or at least two out of the three following events have occurred in the last 12 months: (1) overdue to financial institutions, (2) 90 days overdue to trade creditors, (3) restructuring of any outstanding liabilities; 0 otherwise [0; 1]	FCS	0.233	(0.423)	0	1.000	1106
Endogenous, instrumented variables							
ITS*PPE*	Ratio of annual total Investments to Property, Plant and Equipment (PPE) to sales [%]	BEEPs	6.736	(18.176)	0	341.426	1106
ITS*PE*	Ratio of annual total Investments to Plant and Equipment (PE) to sales [%]	BEEPs	5.429	(13.666)	0	173.958	1093
LTC	Percentage of PPE investments financed by bank loans and suppliers credits [%]	BEEPs	19.599	(34.027)	0	100.000	1106
Exogenous variables							
Size	1 if the company has more than 50 employees [0; 1]	BEEPs	0.393	(0.489)	0	1.000	1106
Age	Age in years since the company started operations in the particular country. For transition countries the beginning year is set to 1987 if reported earlier [years]	BEEPs	13.35	(5.010)	1	23.000	1106
SectorVA, 2009	Percentage change in subindustry value added in 2009 [%]	Eurostat	-14.535	(15.489)	-67.2	80.100	1106
Instruments for Endogenous variables*							
UniGrade	Percentage of the company workforce having a uni- versity degree or higher in 2007 [%]	BEEPs	17.953	(23.335)	0	100.000	1106
CrGDP	Share of private credit to GDP in 2007 [%]	EBRD	50.066	(15.277)	34.7	81.000	1106

* Instruments include additionally country and sector dummies.

Table2.

Name	IV Probit 2-Step	IV Probit FIML	2SLS	LIML	GMM
ITS*PPE*	0.044**	0.032***	0.012	0.014	0.012*
	(0.022)	(0.017)	(0.007)	(0.009)	(0.007)
LTC	0.026***	0.016***	0.008***	0.008**	0.008***
	(0.008)	(0.008)	(0.003)	(0.003)	(0.003)
Age	*-0.014*	*-0.009*	*-0.004*	*-0.004*	*-0.004*
	(0.011)	(0.007)	(0.003)	(0.003)	(0.003)
Size	*-0.395****	*-0.244****	*-0.121****	*-0.123****	*-0.118****
	(0.138)	(0.103)	(0.039)	(0.042)	(0.038)
Crisis, 2009	0.002	0.001	0.001	0.001	0.001
	(0.004)	(0.002)	(0.001)	(0.001)	(0.001)
Intercept	*-1.187****	*-0.754****	0.108**	0.095*	0.109**
	(0.206)	(0.126)	(0.055)	(0.058)	(0.055)
N	1106	1106	1106	1106	1106
Log-Likelihood		-10708			
chi-square	34.397	142.243	42.399	39.446	43.088
p	0	0	0	0	0
Overidentification test	4.410		4.436	4.261	4.436
Overidentification p	0.621		0.618	0.641	0.618

Source: Authors' calculations. Dependent variable is company default from FCS survey data. The cycle gap variable is from Eurostat, the other explanatory variables refer to 2007 data from BEEPS.

Note: Hansen J-statistics used as overidentification test for 2SLS and GMM, Anderson-Rubin chi-square test used for LIML and Amemiya-Lee-Newey minimum chi-square statistics for IV-Probit. ***, **, * stand for 1%, 5% and 10% level statistical significance respectively

Table3.

Variable Name	IVProbit 2-Step	IVProbitFIML	2SLS	LIML	GMM
FCS first wave: June-July 2009, N=561					
ITS*PPE*	0.039*	0.026	0.010	0.012	0.011
	(0.024)	(0.016)	(0.008)	(0.010)	(0.008)
LTC	0.033***	0.018**	0.011***	0.011***	0.011***
	(0.010)	(0.008)	(0.003)	(0.004)	(0.003)
Age	-0.011	-0.006	-0.003	-0.003	-0.003
	(0.017)	(0.009)	(0.005)	(0.005)	(0.005)
Size	-0.486**	-0.272**	-0.151***	-0.158***	-0.155***
	(0.206)	(0.122)	(0.057)	(0.061)	(0.057)
Crisis,2009	0.002	0.002	0.001	0.001	0.001
	(0.005)	(0.003)	(0.001)	(0.001)	(0.001)
Intercept	-1.278***	-0.725***	0.083	0.064	0.076
	(0.310)	(0.155)	(0.081)	(0.087)	(0.081)
Log-Likelihood		-5500			
chi-square	19.404	112.704	26.636	24.168	27.662
p	0.002	0.000	0.000	0.000	0.000
Overidentification test	3.495	3.105	2.842	3.105	
Overidentification p	0.745	0.796	0.828	0.796	
FCS second wave: February-March 2010, N=277					
ITS*PPE*	-0.002	-0.004	-0.000	-0.001	-0.000
	(0.031)	(0.082)	(0.010)	(0.030)	(0.010)
LTC	0.018	0.022	0.006*	0.009	0.006*
	(0.011)	(0.014)	(0.003)	(0.008)	(0.003)
Age	0.006	0.011	0.001	0.004	-0.000
	(0.019)	(0.018)	(0.006)	(0.008)	(0.006)
Size	-0.468*	-0.483*	-0.142*	-0.188	-0.152**
	(0.241)	(0.262)	(0.074)	(0.135)	(0.073)
Crisis, 2009	-0.002	-0.000	-0.001	-0.000	-0.000
	(0.007)	(0.008)	(0.002)	(0.003)	(0.002)
Intercept	-0.987**	-1.001**	0.157	0.065	0.178
	(0.397)	(0.449)	(0.124)	(0.238)	(0.122)
Log-Likelihood		-2600			
chi-square	5.227	10.484	5.379	3.297	6.578
p	0.389	0.063	0.371	0.654	0.254
Overidentification test	7.591		8.385	7.897	8.385
Overidentification p	0.27		0.211	0.246	0.211
FCS third wave: May-June 2010, N=268					
ITS*PPE*	0.141**	0.073***	0.032*	0.039	0.032**
	(0.068)	(0.019)	(0.017)	(0.025)	(0.015)
LTC	0.003	-0.003	0.001	-0.000	0.003
	(0.018)	(0.012)	(0.005)	(0.007)	(0.005)
Age	-0.066**	-0.025	-0.015**	-0.016**	-0.017**

					*
	(0.034)	(0.018)	(0.006)	(0.007)	(0.006)
Size	0.366	0.199*	0.071	0.096	0.061
	(0.382)	(0.112)	(0.073)	(0.091)	(0.074)
Crisis, 2009	0.006	0.002	0.001	0.001	0.001
	(0.010)	(0.005)	(0.002)	(0.002)	(0.002)
Intercept	-1.017**	-0.417**	0.180*	0.159	0.192**
	(0.494)	(0.17)	(0.105)	(0.124)	(0.090)
Log-Likelihood		-2500			
chi-square	9.876	52.903	14.382	12.587	26.868
p	0.079	0.000	0.013	0.028	0.000
Overidentification test	3.205		2.472	1.802	2.472
Overidentification p	0.783		0.872	0.937	0.872

Source: Authors' calculations. Dependent variable is company distress from the FCS survey data. The cycle gap variable is from Eurostat, the other explanatory variables refer to 2007 data from the BEEPS.

Note: Hansen J-statistics used as overidentification test for 2SLS and GMM, Anderson-Rubin chi-square test used for LIML and Amemiya-Lee-Newey minimum chi-square statistics for IV-Probit. ***, **, * stand for 1%, 5% and 10% level statistical significance respectivel

Figure 1. Gross Value Added by all NACE categories and Private Sector Credit to GDP, 2006-2012

Source: The European Central Bank; Eurostat.

Note: BEEPS and FCS fieldwork dates highlighted.

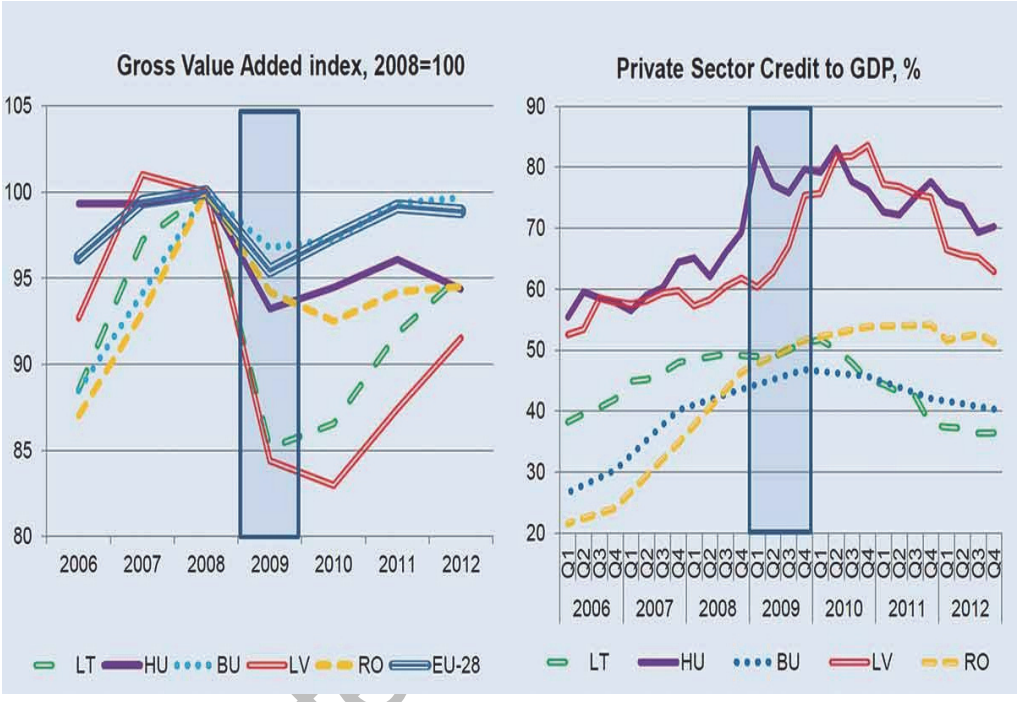


Figure 2. Kernel density estimate for LTC and ITS_{PPE} depending on Company Distress

Source: authors' calculation on the BEEPs data

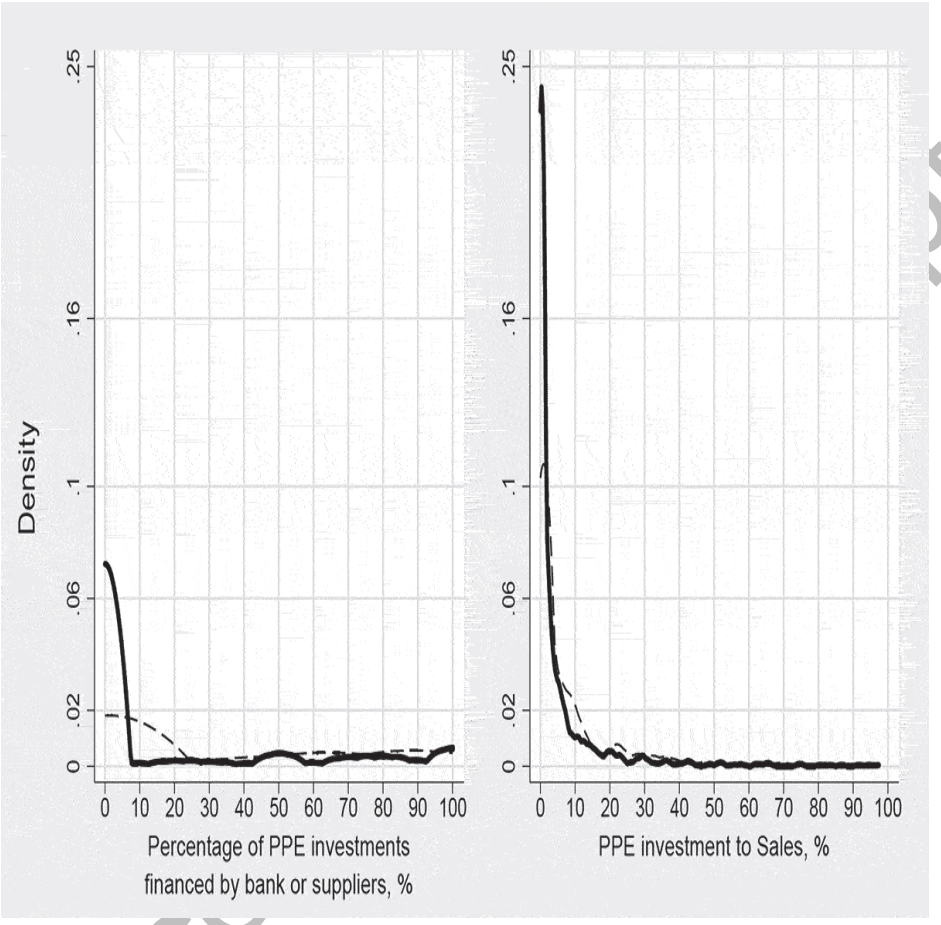


Figure 3. Proportion of company's total purchase of fixed assets financed by different sources, %.

Source: authors' calculations on the BEEPs data

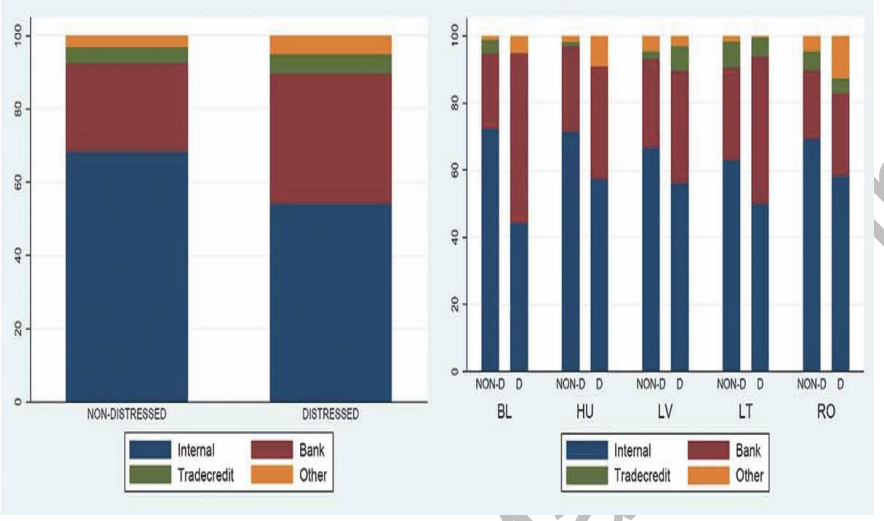


Figure 4. Distress probability at different levels of LTC

Source: authors' calculations based on IVprobit maximum likelihood estimates on the BEEPs and the FCS data

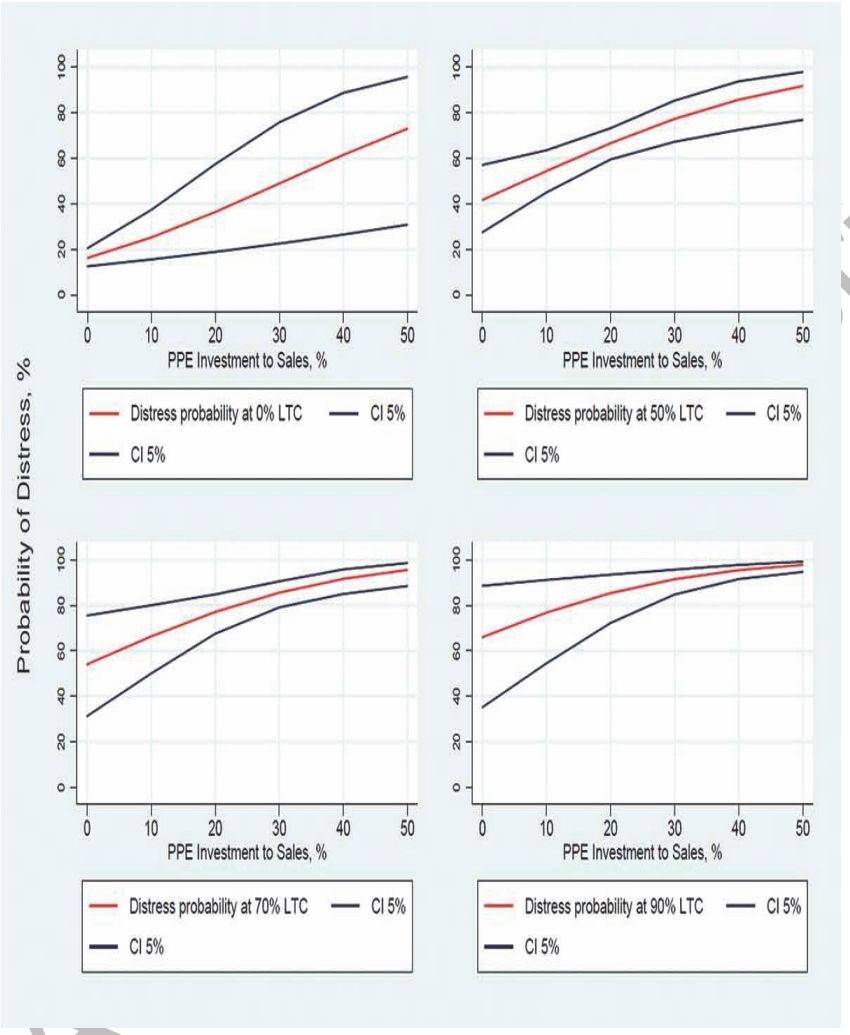
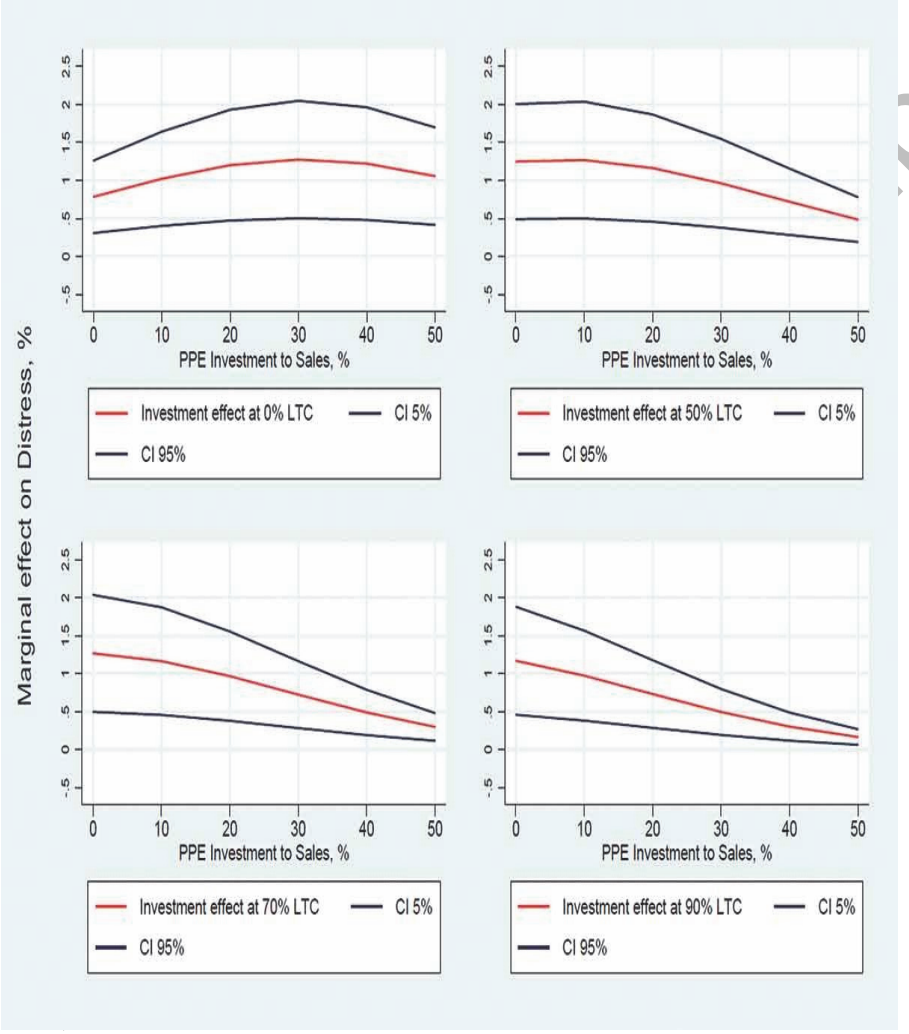


Figure 5. Marginal Effects on Distress for different levels of LTC

Source: authors' calculations based on IVprobit maximum likelihood estimates on the BEEPs and the FCS data



CURRICULUM VITAE

1. Personal data

Name:	Peeter Maripuu
Date of birth:	24 October 1977, Tartu
Citizenship:	Estonian
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2. Education

Educational institution	Graduation Year	Education (Field of study/degree)
Tallinn University of Technology	(2017)	Financial Economics/ Doctor of Philosophy
Tallinn University of Technology	(2012)	Economics / Master of Arts (*Cum Laude*)
Estonian Business School	(2010)	Business Administration/ Bachelor of Arts

3. Language competence/skills (fluent, average, basic skills)

Language	Level
Estonian	native
English	fluent
Russian	basic
Swedish	basic

4. Special courses (selected events)

Period	Course
2007–2008	Courses on risk taking, finance, financial models (Estonia)
2009 –2011	Courses on communication skills, rhetorics and presentation skills (Estonia, Sweden)

5. Professional employment

Period	Organisation/ position
2015 to date	Starman Ltd/ Post: Analyst (1.0)
2007 to 2015	SEB Bank Ltd/ Post: Credit Analyst (1.0)
2001 to 2007	Estonian National Communications Board/ Post: Head of Cost Accounting Department (2002-2007; 1.0) Post: Specialist at Cost Accounting Department (2001; 1.0)

6. Research activity

Publications

Maripuu, P. and Männasoo, K., 2014. Financial Distress and Cycle-Sensitive Corporate Investments. *Baltic Journal of Economics*, Vol. 14, pp. 181 - 193. (ETIS 1.1)

Männasoo, K. and Maripuu, P., 2015. Company Performance, Investment Decision, and Cyclical Sensitivity: A Dynamic Estimation on Company Microdata. *Eastern European Economics*, Vol. 53, pp. 1 - 14. (ETIS 1.1)

Männasoo, K.; Maripuu, P.; Hazak, A., 2017. Investments, Credit and Corporate Financial Distress: Evidence from Central and Eastern Europe. *Emerging Markets Finance and Trade*, [forthcoming]. (ETIS 1.1)

Conference presentations / Conference proceedings

Maripuu, P. and Männasoo, K., 2013. *Financial distress and cycle-sensitive corporate investments*. In: 5th International Conference "Economic Challenges in Enlarged Europe", Conference Proceedings, 16-18 June 2013, Tallinn: Tallinn University of Technology. (ETIS 3.4)

Männasoo, K. and Maripuu, P., 2014. *Company Performance, Investment Decision and Cyclical Sensitivity: a Dynamic Estimation on Company Micro-Data.* In: 6th International Conference "Economic Challenges in Enlarged Europe", Conference Proceedings, 15-17 June 2014. Tallinn: Tallinn University of Technology. (ETIS 3.4)

Männasoo, K., Maripuu, P. and Hazak, A., 2015. *Investments, Credit and Company Distress: Evidence from the Financial Crisis Survey.* In: The 7th international conference "Economic Challenges in Enlarged Europe", Conference Proceedings, 14-16. June 2015, Tallinn: Tallinn University of Technology. (ETIS 3.4)

Männasoo, K. and Maripuu, P., 2014. *Company Performance, Investment Decision and Cyclical Sensitivity: a Dynamic Estimation on Company Micro-Data.* In: Conference Proceedings: Doctoral Summer School 2014, 5-8 August 2014, Kubija. Tartu: Doctoral School in Economics and Innovation. (ETIS 3.4)

Maripuu, P. and Männasoo, K., 2015. *Financial distress and cycle-sensitive corporate investments*. Estonian Economic Association 10th Annual Conference, 30-31 January 2015, Narva-Jõesuu, Estonia. (ETIS 3.5)

ELULOOKIRJELDUS

1. Isikuandmed

Ees- ja perekonnanimi	Peeter Maripuu
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2. Hariduskäik

Õppeasutus (nimetus lõpetamise ajal)	Lõpetamise aeg	Haridus (eriala/kraad)
Tallinna Tehnikaülikool	2017	Finantsökonoomika/doktor
Tallinna Tehnikaülikool	2012	Ärirahandus/teadusmagister (*cum laude*)
EBS	2010	Ärikorraldus/bakalaureus

3. Keelteoskus (alg-, kesk- või kõrgtase)

Keel	Tase
Eesti keel	Emakeel
Inglise keel	Kõrgtase
Rootsi keel	Algtase
Vene keel	Algtase

4. Täiendusõpe

Õppimise aeg	Täiendusõppe korraldaja nimetus
2007–2008	Kursused riski võtmisest, rahandusest, finantsmudelitest (Eesti)
2009 –2011	Kursused kommunikatsioonist, retoorikast ja presenteerimisest (Eesti, Rootsi)

5. Teenistuskäik

Töötamise aeg	Tööandja nimetus/ ametikoht (koormus)
2015 –	Starman AS/ Analüütik (1.0)
2007 – 2015	SEB Bank AS/ Krediidianalüütik (1.0)
2001 – 2007	Sideamet/ Kuluarvestuse osakonna juhataja (2002-2007; 1.0) Kuluarvestuse osakonna spetsialist (2001; 1.0)

6. Teadustegevus*

Publikatsioonid

Maripuu, P.; Männasoo, K., 2014. Ettevõtete finantsraskused ja tsüklitundlikud investeeringud. *Baltic Journal of Economics*, Vol. 14, pp. 181 - 193. (ETIS 1.1)

Männasoo, K.; Maripuu, P., 2015. Ettevõtete investeerimisotsused, majandustsükkel ja jätkusuutlikkus: Ettevõtete mikroandmete hindamine dünaamilise mudeliga. *Eastern European Economics*, Vol. 53, pp. 1 - 14. (ETIS 1.1)

Männasoo, K.; Maripuu, P.; Hazak, A., 2017. Investeeringud, finantseerimine ja finantsraskused: Tulemused Kesk- ja Ida-Euroopast. *Emerging Markets Finance and Trade* [ilmumas]. (ETIS 1.1)

Konverentsiettekanded / eelpublitseerimine konverentsimaterjalidena

Maripuu, P.; Männasoo, K., 2013. *Ettevõtete finantsraskused ja tsüklitundlikud investeeringud.* 5th International Conference "Economic Challenges in Enlarged Europe", Conference Proceedings, 16-18 June 2013, Tallinn: Tallinn: Tallinna Tehnikaülikool. (ETIS 3.4)

Männasoo, K.; Maripuu, P., 2014. *Ettevõtete investeerimisotsused, majandustsükkel ja jätkusuutlikkus: Ettevõtete mikroandmete hindamine dünaamilise mudeliga.* 6th International Conference "Economic Challenges in Enlarged Europe", Conference Proceedings, 15-17 June 2014, Tallinn. Tallinn: Tallinna Tehnikaülikool. (ETIS 3.4)

Männasoo, K., Maripuu, P. and Hazak, A., 2015. *Investeeringud, finantseerimine ja finantsraskused: Uurimistulemused finantskriisi küsimustiku põhjal*. 7th international conference "Economic Challenges in Enlarged Europe", Conference Proceedings, 14-16. June 2015, Tallinn: Tallinna Tehnikaülikool. (ETIS 3.4)

Männasoo, K.; Maripuu, P., 2014. *Ettevõtete investeerimisotsused, majandustsükkel ja jätkusuutlikkus: Ettevõtete mikroandmete hindamine dünaamilise mudeliga.* Conference Proceedings: Doctoral Summer School 2014, 5-8 August 2014, Kubija. Tartu: Doctoral School in Economics and Innovation. (ETIS 3.4)

Maripuu, P.; Männasoo, K., 2015. *Ettevõtete finantsraskused ja tsüklitundlikud investeeringud.* Estonian Economic Association 10th Annual Conference, 30-31 January 2015, Narva-Jõesuu, Estonia. (ETIS 3.5)

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