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Operating risk and financial performance: evidence from non-listed firms in manufacturing sector

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Motivation

- COVID-19 pandemic -> power to increase firm's operating risk
  - Operating risk is defined as the risk of not reaching the desired level of operating income (EBIT)
    - Corporate finance: break-even-point analysis and operating leverage effect
    - Interplay between firm's operating revenues and operating costs (fixed cost in particular)
- During pandemic:
  - Lockdown: inability to operate and generate sales revenues
  - Increased operating costs
- Awareness of firm's vulnerability to operating risk drivers is critical for managerial decisions
  - Total risk exposure (relevant for holistic risk governance)
  - Understand the interplay between operating risk drivers and firm's insolvency
  - Avoid short-terminizm in decision making

Existing research gaps

- **Risk type:** the majority of existing works is concerned about the effects of financial risk on firm's performance or the interim effects of financial risk and operating risk (financial and operating leverage)
  - Studies that refer to operating risk only are scarce
- **Sample:** studies on listed firms are prevalent
  - Limited evidence on non-listed firms (more difficult to obtain data)
  - SMEs context
- **Sector:** there is evidence that the level of operating risk is sector sensitive, but the studies that revise a single sector perspective are scarce
- **International context:** there is evidence on country-specifics, but studies that focus on single country/group of homogenous countries are rare

Aim

- to examine the effects of operating risk on the performance of non-listed firms that operate in manufacturing sector, in four emerging European countries:
  - Czech Republic, Slovakia, Hungary and Poland (V4)
- The design of the study is motivated by two recent works: Grau and Reig (2020) and Chen et al. (2019)

Hypotheses

- *H1. Greater operating risk exerts a negative impact on firm's profitability*
- *H2. The effects of operating risk on firm's profitability are unified across the V4 countries*

Sample composition

		CZ	HU	SLO	PL	In total
Number of all firms recorded in EMIS database for manufacturing sector (NAICS 31-33)		3692	7392	3364	27906	42354
No of firms performing in manufacturing sector according to Eurostat, as on 2017 (the first year of observations)		175894	50809	72563	198757	498023
The percentage of firms in EMIS database, relative to Eurostat dataset		2.10%	14.55%	4.64%	14.04%	8.50%
Downloaded observations from EMIS database						
number of records		600	600	600	1500	3000
as a % of the number of all available records		0.341%	1.181%	0.827%	0.755%	0.602%
Final sample (after filtering out the firms that operate at least four years)						
	2019	580	392	491	1039	2502
	2018	585	380	472	1015	2452
	2017	578	376	433	997	2384
In total, as the number of firm-year observations		**1743**	**1148**	**1396**	**3051**	**7338**

Sub-sector of manufacturing (31-33)	NAICS code	N	% of the sample
Food manufacturing	311	1163	15.85%
Beverage and Tobacco	312	167	2.28%
Textile Mills	313	26	0.35%
Textile product mills	314	39	0.53%
Apparel manufacturing	315	20	0.27%
Leather and allied product manufacturing	316	38	0.52%
Wood product manufacturing	321	144	1.96%
Paper manufacturing	322	216	2.94%
Printing and related support activities	323	59	0.80%
Petroleum and coal product manufacturing	324	64	0.87%
Chemical manufacturing	325	565	7.70%
Plastic and rubber	326	671	9.14%
Nonmetalic mineral product manufacturing	327	448	6.11%
Primary metal manufacturing	331	282	3.84%
Fabricated metal	332	642	8.75%
Machinery manufacturing	333	540	7.36%
Computer and electronic product manufacturing	334	283	3.86%
Electrical Equipment, Appliance, and Component Manufacturing	335	474	6.46%
Transportation Equipment Manufacturing	336	1202	16.38%
Furniture and Related Product Manufacturing	337	194	2.64%
Miscellaneous Manufacturing	339	101	1.38%
In total		**7338**	**100.00%**

Definitions of the variables

Variable	Definition
ROA_op	return on total assets, computed as operating profit to total assets op. profit /assets
RISK_op	operating risk, proxied by fixed assets to total assets (as a measure of operating leverage)
RISK_fin	financial risk, proxied by debt to total assets (as a measure of financial leverage)
Size	firm's size, proxied by natural logarithm of sales revenues
Age	number of years since firm's inception and the year of observations
LIQ_CR	current ratio of liquidity, computed as current assets to short-term debt
CASH	cash ratio, computed as cash and cash equivalents, relative to total assets
OPM	operating profit margin, computed as operating profit to sales revenues

Model

$$ROA = \beta_0 + \beta_1 RISK_{op} + \beta_2 RISK_{fin} + \beta_3 AGE + \beta_4 SIZE + \beta_5 LIQ_{CR} + \beta_6 CASH + \beta_7 OPM + \varepsilon$$

Descriptive statistics

Variable	mean	St.Dev.	min	25%	50%	75%	max
ROA_op	0.08	0.10	-0.71	0.03	0.07	0.12	0.92
RISK_op	0.45	0.20	0.00	0.30	0.45	0.59	0.97
RISK_fin	0.52	0.26	0.02	0.32	0.52	0.69	5.38
AGE	17.60	8.06	4.00	13.00	17.00	22.00	107.00
SIZE*	153.15	505.69	4.55	41.88	66.53	130.76	17883.53
LIQ_CR	1.86	1.84	0.00	0.99	1.39	2.16	64.56
CASH	0.06	0.09	0.00	0.01	0.03	0.08	0.87
OPM	0.06	0.07	-0.66	0.02	0.04	0.08	0.79

*Notes: *Size is proxied by natural logaritm of sales revenues, however, in this table we provide the value of sales revenues, in mlns of EUR*

Correlations

	ROA_op	RISK_op	RISK_fin	AGE	SIZE	LIQ_CR	CASH	OPM
ROA_op	1.000000	-0.072015	-0.337987	0.071114	0.031833	0.359348	0.239569	0.852516
RISK_op	-0.072015	1.000000	-0.133122	-0.025146	-0.072112	-0.201098	-0.147275	0.055109
RISK_fin	-0.337987	-0.133122	1.000000	-0.134612	0.043447	-0.733304	-0.260033	-0.449595
AGE	0.071114	-0.025146	-0.134612	1.000000	0.069256	0.121516	0.008754	0.089745
SIZE	0.031833	-0.072112	0.043447	0.069256	1.000000	-0.068166	-0.072478	0.005169
LIQ_CR	0.359348	-0.201098	-0.733304	0.121516	-0.068166	1.000000	0.371250	0.396199
CASH	0.239569	-0.147275	-0.260033	0.008754	-0.072478	0.371250	1.000000	0.225663
OPM	0.852516	0.055109	-0.449595	0.089745	0.005169	0.396199	0.225663	1.000000

Notes: all correlations coefficients are statistically significant at 1%.

WLS regression results for ROA_op (country specifics)

Explanatory variables	CZ		SLO		HU		PL	
Intercept	0.4460	***	0.2200	***	0.0553		-0.0697	***
RISK_op	0.0199	***	-0.0094	**	-0.0138		-0.0532	***
RISK_fin	-0.0590	***	-0.0052		-0.1580	***	-0.0239	***
AGE	-0.0508	***	0.0115	**	0.1141	***	0.0272	***
SIZE	0.0047		0.0136	***	0.0281	***	0.0142	***
LIQ_CR	-0.0267	***	0.0016		-0.2103	***	0.0218	***
CASH	0.0300	***	0.0207	**	0.2716	***	-0.0010	
OPM	0.8034	***	0.7854	***	0.6050	***	0.6590	***
R-squared	0.921		0.881		0.891		0.900	
F	2908	***	1464	***	1327.	***	3907.	***

- although the operating risk exerts a negative impact on profitability, the country-effects are influential in this regard, which confirms Grau and Reig (2020) observations for isolated sector

Implications

- the impact of operating risk on firm's performance is complex and requires deep understanding on both the firm-specific factors, as well as the impacts of country-level institutional settings
- managers need to pay particular attention to recognize the determinants of firm's operating environment. In particular, given our evidence on the inconclusive effects of liquidity constraints in cross-country dimension, as well as the effects of financial risk (for the whole sample), managers should be well aware of the interplay of operating and financial risk and the related bankruptcy threat. This gives raise and justification for holistic approach in risk governance.

Implications

- The observed negative effects of operating risk exposure, together with the strong positive impact of operating profit margin, are important if we consider firm's resilience strategies, if facing a shock
  - The evidence for our sample (manufacturing non listed firms that operate in V4 countries) suggests that in the currently faced disturbances in the aftermath of COVID-19 outbreak, these firms are highly exposed to loss of operating income.
  - Thus, our study indicates that the effects of COVID-19 hit on the performance of these firms could be significant.
  - In this regard, policy makers need to consider the contribution of manufacturing sector to the economy, as well as revise the need and the desired directions of the potential supportive measures (and the related system interventions).
  - These effects need further studies and empirical investigations, to confirm their potential longitude effects, as well as the scale of disruptions in the profitability-oriented context.

Further work

- investigate more-in-depth the homogeneity of the observed effects across sub-sectors of manufacturing industry
- revise the homogeneity of the observed effects by comparing profitable and unprofitable firms, as well as those of high and low operating leverage
- revise the homogeneity of the observed effects by comparing smaller and larger firms in our sample
- Relevance of country-settings in explaining the effects of operating risk on firm's performance
  - further studies need to address the differences between the V4 countries, if we consider incentives of innovativeness, as well as the factors that drive incentives to increase financial leverage
  - revise the drivers of financial risk could be informative as well, with the consideration of the macroeconomic and institutional exogenous factors

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