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Management Review Quarterly

Provided in Cooperation with:
Springer Nature

Suggested Citation: Höge-Junge, Christin; Eckert, Stefan (2022) : Multinationality and systematic risk: a literature review and meta-analysis, Management Review Quarterly, ISSN 2198-1639, Springer International Publishing, Cham, Vol. 74, Iss. 1, pp. 377-414, https://doi.org/10.1007/s11301-022-00304-6

Management Review Quarterly (2024) 74:377–414
https://doi.org/10.1007/s11301-022-00304-6

Multinationality and systematic risk: a literature review and meta-analysis

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Received: 18 January 2022 / Accepted: 24 October 2022 / Published online: 18 November 2022

Abstract

In the literature, the impact of multinationality on the valuation of multinational companies is heavily debated. To understand this impact on valuation, we need to clarify whether and how multinationality affects systematic risk. For this purpose, we analyze the state of research concerning the impact of corporate multinationality on systematic risk, conducting a systematic literature review of 35 studies and a univariate meta-analysis based on 20 studies. We test the predictions of the upstream–downstream hypothesis and the increasing capital market integration hypothesis on the basis of a meta-regression analysis of 17 studies. Our results provide no empirical support for the upstream–downstream hypothesis. However, they corroborate the capital market integration hypothesis in a more radical manner than expected: whereas multinationality seemed to have a risk-reducing effect until the beginning of the 1990s, since then its impact appears to have shifted. We find a risk-increasing effect for multinationality from 1990 on. Our results have important implications for academic research and managerial practice.

Keywords Multinationality · Systematic risk · Capital market integration · Upstream–downstream-hypothesis · Univariate meta-analysis · Meta-regression analysis

JEL Classification F23 · F30 · G11 · G31 · G32 · L25 · M16

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1 Introduction

The impact of corporate multinationality on systematic risk is an essential issue for academic research as well as for business practice (Reeb et al. 1998; Song et al. 2017). Systematic risk, also referred to as market risk or beta, is the component of a company's total risk that is inherent in a market and affects all companies in that market to a specific degree (Shapiro and Balbirer 2000). A geographical expansion of a company beyond the borders of the home country may lead to a change in the level of the company's systematic risk. Surprisingly, the impact of multinationality on systematic risk has been analyzed relatively rarely in the academic literature up to now (Kwok and Reeb 2000). However, it is a topic of utmost importance. We have to clarify whether and how multinationality affects systematic risk in order to really be able to understand the valuation impact for multinational companies, a heatedly debated issue in the literature (Contractor 2007; Eckert et al. 2016; Hennart 2007). Since finance scholars generally use the stock market value of the firm as a measure of firm performance, the issue also has implications for answering the question of the relationship between multinationality and performance (Li 2007). Furthermore, the question of the relationship between multinationality and systematic risk bears profound practical implications: modern methods to estimate the market value of a firm build on valuation models, which employ the systematic risk of a company in order to generate adequate discount rates for its estimated future cash flows. If a company is multinational, we need to know how multinationality affects systematic risk to calculate the correct weighted average cost of capital and formulate a profound investment decision.

The objective of this paper addresses this research gap. We contribute to the debate on the impact of multinationality on systematic risk. We review extant research by conducting a systematic literature review as well as a univariate meta-analysis and a meta-regression analysis. We focus on two theoretical arguments to explain differences in the effect of multinationality on systematic risk. The first argument is the so-called upstream–downstream hypothesis: Kwok and Reeb (2000) argue that firms from stable economies investing in unstable countries might experience increases in systematic risk, while firms from unstable home countries investing in more stable target countries might experience decreases in systematic risk. We refer to the second argument as capital market integration hypothesis: Following this line of reasoning, the effects of multinationality on systematic risk may have diminished over time as a consequence of an increase in global integration of national capital markets.

Our findings indicate that international diversification arising from multinationality contributed to a reduction of systematic risk in the past; however, it has resulted in an increase in systematic risk since the 1990s. Increasing market integration could be an explanation for the shift regarding the impact of multinationality on systematic risk. One important implication of our findings is that future research has to take consideration of an international market portfolio as the reference market for estimating systematic risk. Furthermore, corporate executives should carefully rethink their internationalization steps if they want to increase the firm's capital market value.

Considering the recommendations of Fisch and Block (2018), Kuckertz and Block (2021), Hansen et al. (2022), this paper is divided into six sections. Theoretical arguments why and how multinationality might affect a firm's systematic risk are presented

in the second section. In the third section, we explain the selection of academic papers included in our analysis and our research design. In the fourth section, the results of our systematic literature review are provided. Building on the findings of our literature review, we develop hypotheses and report the results of our univariate meta-analysis and meta-regression analysis. In the sixth section, we discuss our findings and show implications.

2 Theoretical background

According to modern portfolio theory, the risk of a security can be divided into two mutually exclusive components: systematic risk and unsystematic risk. Following the Capital Asset Pricing Model (CAPM) only systematic risk has to be compensated whereas unsystematic risk can be eliminated through diversification. Empirical research has shown that international diversification contributes to this elimination of unsystematic risk (Amit and Livnat 1988; Michel and Shaked 1986).

International business (IB) scholars have used portfolio theory to examine the effect of a firm's internationalization and thus firm's multinationality on its risk (Song et al. 2017). Multinational companies can diversify the portfolio of their activities by means of international geographical dispersion and reduce their systematic risk due to the reduced volatility of earnings (Bution et al. 2015; Olibe et al. 2008; Song et al. 2017). However, the portfolio concept was originally developed in finance theory under the assumption of perfect markets (Song et al. 2017). IB scholars like Rugman (1976), Reeb et al. (1998) argue that expanding internationally, whether by establishing new subsidiaries or acquiring foreign firms, can be compared to the construction of a stock portfolio. Although this argumentation has raised severe criticism and, in the meantime, there has been a proliferation of theoretical explorations to explain the performance impact of multinationality, portfolio theory and the CAPM still provide the theoretical foundation to consider the impact of multinationality on firm risk.

From an investor's point of view systematic risk is defined as:

$$\beta_i = \frac{\rho_{jm} \times \sigma_j}{\sigma_m}$$

with:

ρ_{jm}: correlation coefficient between security j and the market m;

σ_j: standard deviation of security j;

σ_m: standard deviation of the market m.

In order to understand the impact of multinationality on systematic risk, we must assess how internationalization and thus international diversification affects the individual components of beta. Assuming that the effect of internationalization on σ_m is marginal, we can concentrate on the numerator. Conventional argumentation in the literature is that ρ_{jm} decreases through international diversification due to the low correlation of foreign markets with the home market of multinational corporations (MNCs) (Aggarwal 1977). However, this effect presupposes that the reference market m is the home market of the MNC. As our literature review will show, the overwhelming majority of extant research contributions follows this presumption.

In addition to the effect on ρ_{jm}, multinationality has an impact on σ_j, the standard deviation of firm j. This component can on the one hand be expected to increase through internationalization due to exchange rate risk (Bartov et al. 1996; Reeb et al. 1998) and political risk (Choi and Severn 1992; Reeb et al. 1998)).[1] In this regard the typical argument in the literature is that multinationality leads to an increase in a firm's foreign exchange exposure which raises the variations of foreign returns in domestic currency (Reeb et al. 1998). Furthermore, it is argued that international firms experience an increase in exposure to political risk due to the dangers of the appropriation of foreign assets by host country governments, unanticipated regulatory changes induced by host countries, corruption, and so on (Reeb et al. 1998). However, this argumentation implicitly considers the case of a multinational corporation based in a developed home country entering host markets in developing countries. In contrast, emerging market MNCs may not suffer from significant increases in exposure to political risk when entering developed country markets (Kwok and Reeb 2000). On the other hand, if country markets are not perfectly correlated, multinationality may also lead to a compensation of country-specific variations in cash flows and therefore contribute to a reduction in cash flow variance.

3 Methodology

Our first step in identifying the overall effect of multinationality on beta is to systematically review existing empirical research on the impact of multinationality on the market-based risk measurement of beta available as of August 2021. Papers relevant to our interest are detected by researching "Business Source Premier" of EBSCO, the databases of Elsevier and Springer, and the web search engine Google Scholar. We browse for English articles including specific terms in title or abstract,[2] which are relevant to our research question. These terms are depicted in Fig. 1. We understand "multinationality" as a firm's geographic diversification of operations. Papers about the diversification of other firm related aspects like the international diversification of ownership remain unconsidered.[3] Academic contributions focusing on firms from the financial services industry are also neglected due to industry-specific aspects.

In addition to the database query, leading journals are searched by scanning the titles and abstracts of published papers. Since the topic is related to the field of international business as well as financial research, we consider journals from both fields. The journals are chosen using the SCImago Journal Ranking 2020 for business, management, and accounting journals as well as economics, econometrics,

[1] Reeb, Kwok, and Baek (1998) furthermore argue for an increase in risk due to a weaker ability to monitor and discipline firm management.

[2] Search options in the database of Springer and Google Scholar are limited to searches of publication titles.

[3] In this context, emphasis should be placed on Chira and Marciniak (2014), which neglect a firm's geographic diversification but discuss possible differences in systematic risk between domestic and cross-listed firms. In light of an effect on systematic risk, cross-listing and its potential benefits should be borne in mind for future studies.

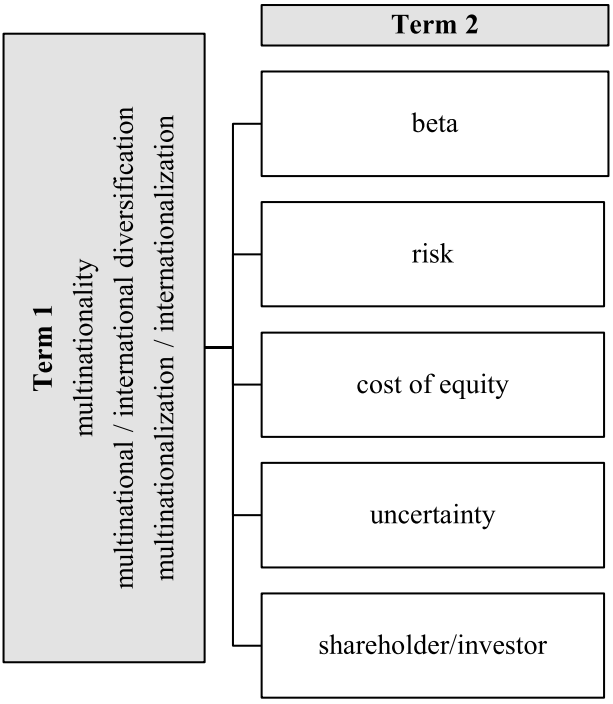

Fig. 1 Search terms and their combination. Term 1 and Term 2 are combined in an And-Boolean search

and finance journals. We confine our retrieval to the journals of the first 35 and 25 ranks, respectively. As the journals of Elsevier and Springer are already included in the database query, we concentrate on the following journals (journals preventing a search limited on title or abstract are excluded):

- Academy of Management Journal
- Strategic Management Journal
- Journal of International Business Studies
- Journal of Management Studies
- Academy of Management Perspectives
- Strategic Organization
- Journal of Finance
- Review of Financial Studies
- Journal of Management
- Review of Finance
- Review of Corporate Finance Studies

To complement our research, we scan the citations and the list of references of the papers already identified. Finally, we send a request to the AIB list servers and scan titles and abstracts of working papers available on the Social Science Research

Network (SSRN) server to uncover unpublished research in order to address the problem of publication bias.[4]

The database queries result in 2282 papers and 1911 papers after removing duplicates. These studies are subsequently screened by title and abstract and 1888 studies are excluded due to deviating research questions and inappropriate measures of risk (see Fig. 2). A close examination of the reference list of the remaining papers identifies another 12 studies.[5] Finally, 35 studies are included in the analysis (see Table 1) notwithstanding a broad range of search terms. These papers are subsequently classified according to different aspects relevant for our analysis, e.g., the statistical methods applied, measurements of multinationality, and sample characteristics, and qualitatively reviewed in respect of their empirical results. The literature review is quantitatively summarized. We use vote counting in order to identify possible structural similarities between studies disclosing similar findings in order to give indications for subgroups and moderating variables. We do not intend to make conclusive statements about the true effect of multinationality on this basis.

In addition to the qualitative review, we summarize the empirical findings with the help of a univariate meta-analysis and meta-regression analysis using the software package Comprehensive Meta-Analysis (CMA).[6] We consider the current discussion on the possible impact of multinationality and base our summary on hypotheses related to firms' home country and time. Univariate meta-analysis is a suitable method to summarize, integrate, and interpret the results of various studies, but it only applies to empirical research studies with quantitative findings that can be meaningfully compared in the form of an effect size (Lipsey and Wilson 2000). In view of this, the statistical analysis is restricted to certain papers so that the data basis of meta-analysis decreases further compared to the qualitative review. Due to the differences regarding the statistical methods applied and the statistical data reported, we divide the remaining papers into groups as the type of effect size must be the same to allow a meaningful analysis (Lipsey and Wilson 2000). We translate the specific research method employed as a study descriptor into codes and conduct two separate effect size statistics for analyzing sample comparison findings and regression results.[7] In the light of meta-regression analysis we further code the home countries of the firms in the respective samples, distinguishing between non-US and US data as well as developing and emerging country data. In addition, we classify the samples according to the time period of analysis between 1960–1989 and 1990–present.

[4] See Fisch and Block (2018) as well as Kuckertz and Block (2021) on the need for a detailed description of the review process with the goal of transparency and repeatability of the literature review.

[5] Haegele (1974) and Thomsen (2012) may also deal with our research question. Their results, however, cannot be obtained.

[6] Specifically, CMA v.3 is used.

[7] The results of further statistical methods, e.g., (M)ANCOVA and semiparametric regression, are not examined.

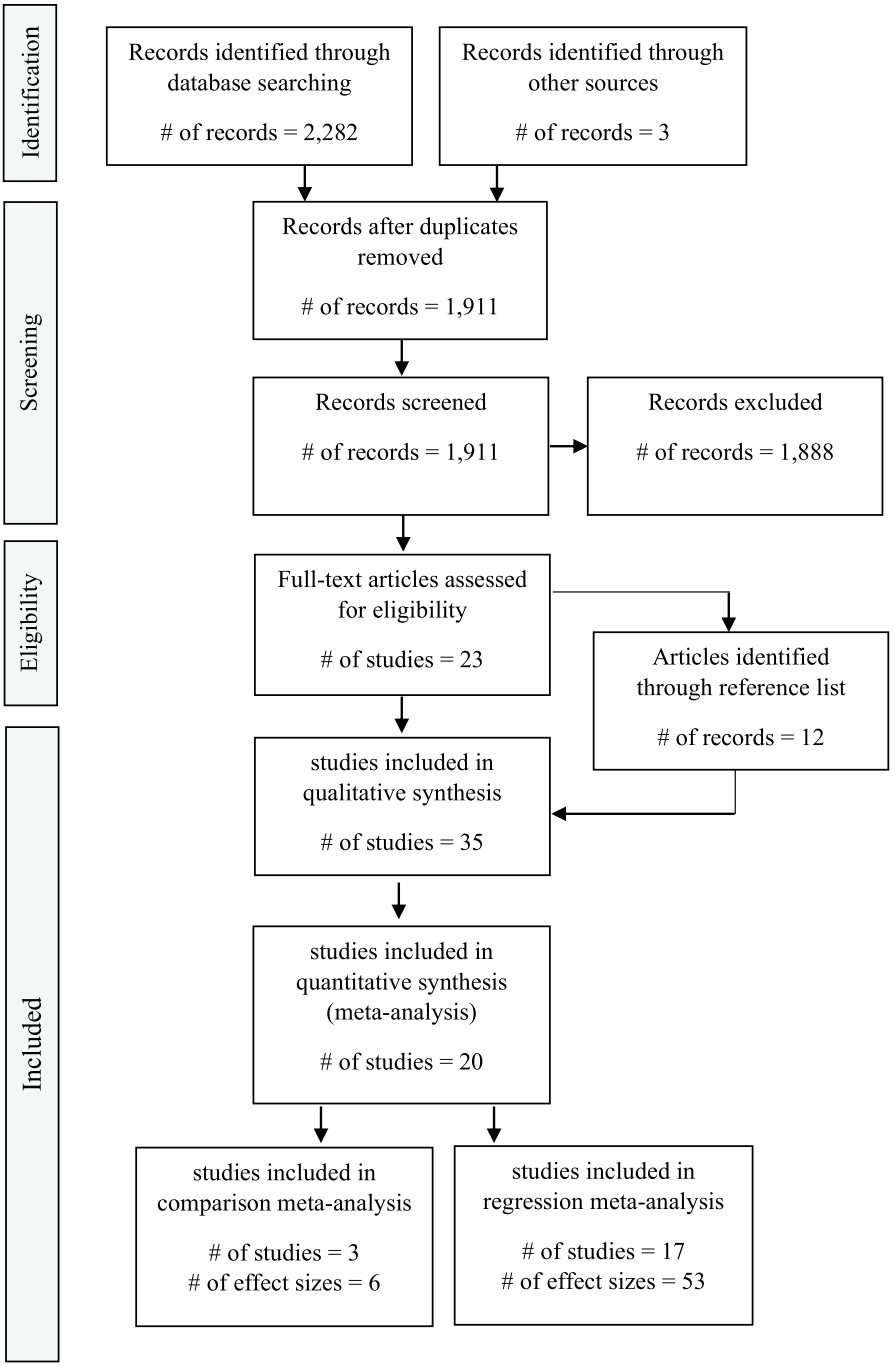

Fig. 2 PRISMA flowchart of the systematic literature review

Table 1 Overview of publications

	Publication	Origin of companies	Time Horizon	Statistical method	Effect size	Proxy[b]	Relation-ship[c]	Number of observations
1	Aggarwal (1979)	USA	1974	Simple linear regression	COR	FIR	−**	171
						FSR	−*	149
						FAR	−***	165
2	Agmon and Lessard (1977)	USA	1959–1972	Simple linear regression	COR	FSR	−**	217
3	Bany-Ariffin et al. (2016)	Malaysia	2002–2009	Semiparametric regression	COR	Other	−**[5]	581
4	Barone (1983)	USA	1974	Simple linear regression	COR	FIR	−	162
			1975			FIR	−	168
			1976			FIR	+	154
			1977			FIR	+	166
			1978			FIR	+	166
			1979			FIR	+	164
			1974			FSR	−	141
			1975			FSR	−	164
			1976			FSR	+	165
			1977			FSR	+*	179
			1978			FSR	+**	174
			1979			FSR	−	170
			1974			FAR	−***	156
			1975			FAR	−**	174
			1976			FAR	−	171
			1977			FAR	−	181
			1978			FAR	+	175
			1979			FAR	−	170

Table 1 (continued)

	Publication	Origin of companies	Time Horizon	Statistical method	Effect size	Proxy[b]	Relation-ship[c]	Number of observations
5	Brewer (1981)	USA	1963–1975	Sample comparison	–	–	o	288
6	Broaden and Samii (2001)	USA	1994–1998	Simple linear regression	–	FSR	+	103
						FAR	+	
						Other	+	
7	Bution et al. (2015)	Brazil	2013	Simple linear regression	COR	FSR	+**	17
8	Bühner (1987)[a]	Germany	1966–1981	Multiple linear regression	–	Other	o	40
9	Chambliss et al. (1994)	USA	1983–1991	Multiple linear regression	–	FSR/ FAR	–	286
10	Collins (1990)	USA	1976–1985	Sample comparison—developed countries -	–	FAR/ FSR	o	95
				Sample comparison—developing countries -	–	FAR/ FSR	–	89
11	Fatemi (1984)	USA	1976–1980	Simple non-linear regression[6]	COR	FSR	–*	136
				Sample comparison	SDM	FSR	–***	136
12	Goldberg and Heflin (1995)	USA	1977–1987	Multiple linear regression	COR	FSR	–**	1480
13	Harjito et al. (2018)	Malaysia	2011–2015	Multiple linear regression- Asian countries-	COR	Other	+[e]	61
				Multiple linear regression- Non-Asian countries-	COR	Other	+[e]	46
14	Hughes et al. (1975)	USA	1970–1973	Sample comparison	–	–	–*	96
15	Jacquillat and Solnik (1978)[a]	USA	1966–1974	Simple linear regression	COR	DSR	+	23

Table 1 (continued)

	Publication	Origin of companies	Time Horizon	Statistical method	Effect size	Proxy[b]	Relation-ship[c]	Number of observations
16	Joliet and Hübner (2008)	Finland	1998–2003	Simple linear regression	–	FSR	+	91
		France	1998–2003	Simple linear regression		FSR	−**	218
		Germany	1998–2003	Simple linear regression		FSR	+	205
		Italy	1998–2003	Simple linear regression		FSR	−***	136
		Netherlands	1998–2003	Simple linear regression		FSR	+**	105
		Spain	1998–2003	Simple linear regression		FSR	−	60
		Sweden	1998–2003	Simple linear regression		FSR	+*	94
		Switzerland	1998–2003	Simple linear regression		FSR	+	97
		UK	1998–2003	Simple linear regression		FSR	+	375
17	Jung (2015)	USA (SIC 5812)	2000–2013	Multiple non-linear regression[f]	COR	CONT	+[e]	645
18	Jung et al. (2018a, b)	USA (SIC 5812)	2000–2013	Multiple linear regression	COR	CONT	+[e]	603
19	Jung et al. (2018a)	USA (SIC 5812)	2000–2013	Multiple linear regression	–	CONT	−	238
20	Kohers (1976)	USA	1963–1972	Sample comparison	–	Other	o	103
21	Krapl (2015)	USA	1985–2011	Multiple linear regression	COR	FSR	+***	125.580
						FAR	+***	60.332
						SEG	+***	126.424
						Other	+***	286.105
22	Kwok and Reeb (2000)	World	1994–1996	Multiple linear regression- US companies-	–	FAR	−***	264
				Multiple linear regression- rest of the world -		FAR	+*	

Table 1 (continued)

	Publication	Origin of companies	Time Horizon	Statistical method	Effect size	Proxy[b]	Relation-ship[c]	Number of observations
23	Madura and Rose (1989)	USA	1986	Multiple linear regression	–	FSR	–	138
						Other	+**	
24	Marciano and Herlambang (2016)	Indonesia	2010–2014	Multiple linear regression[6]	–	FSR	+***	385
25	Michel and Shaked (1986)	USA	1973–1982	Sample comparison	–	FSR	−***	101
26	Olibe et al. (2008)	USA	2000–2004	Multiple linear regression	COR	FSR	+**	359
						FAR	+**	539
						SEG	+	530
						CONT	+***	530
27	Reeb et al. (1998)	USA	1987–1996	Multiple linear regression	COR	FSR	+***	424
						FAR	+***	409
28	Severn (1974)[a,b]	USA	1959–1966	Multiple linear regression	–	FAR	o	60
29	Shafigullin (2016)	Russia	2000–2015	Multiple linear regression	COR	FSR	+	465
30	Shaked (1985)	USA	1980–1982	Sample comparison	SDM	FSR	−***	101
31	Shyu and Ou (2009)[a]	Taiwan	2001–2005	Multiple linear regression	–	FSR	+	100
						Other	−**(*)	100
32	Siegel et al. (1995)	USA	1968–1987	Sample comparison	SDM	FTR	−**	1696
				(M)ANCOVA	–	FTR	–	1696
33	Song et al. (2017)	USA (SIC 5812)	2010–2013	Multiple non-linear regression$_f$	COR	Other	+***	252
34	Theerathorn et al. (1992)	USA	1973–1987	Multiple linear regression	–	FTR	+**[d]	899
				Sample comparison	–	FTR	+***	899
				(M)ANCOVA	–	FTR	+***	899
35	Thompson (1985)	UK	1974–1978	Multiple linear regression	–	FSR	−***	45

Table 1 (continued)

[a]Papers not primarily aimed to analyse beta

[b]*FAR* Foreign Asset Ratio, *FIR* Foreign Income Ratio, *FSR* Foreign Sales Ratio, *FTR* Foreign Tax Ratio, *SEG* Number of Geographical Segments, *CONT* Number of Foreign Subsidiaries

[c]*, **, *** Indicate that the result is significant at 10, 5, and 1% levels, respectively

[d]Assessment is based on statement of the author as the paper lacks any documentation of statistical significance

[e]Algebraic sign of Pearson's product-moment correlation deviates cxsfrom the sign of the regression coefficient. Referring to the subsequent meta-analysis, we refer to the product-moment correlation

[f]Direction and significance of the relationship also stem from analyzed linear regression models irrespective of the further results of the multiple non-linear regression models

4 Literature review

4.1 Methodological differences

Several papers adopt our research question and analyze the relationship between multinationality and systematic risk. The papers differ according to several specific methodological aspects as shown in Table 1.

First, different statistical methods are applied. The papers can be classified either into the category of regression analysis or the category of statistical sample comparison.

As can be seen from Fig. 3, statistical comparison is a common method in the papers of the early years (Brewer 1981; Fatemi 1984; Hughes et al. 1975; Kohers 1976; Shaked 1985, etc.), whereas the majority of subsequent studies focuses on regression analysis. Exceptions to this are the paper of Severn (1974), Siegel et al. (1995) and Theerathorn et al. (1992). The latter two studies reflect the incipient development within the applied statistical methods by extending the sample comparison to a simple analysis of covariance (Theerathorn et al. 1992); or even a multiple analysis of covariance (Siegel et al. 1995). Within regression analysis, static regression models predominate alternative dynamic models. Only Bany-Ariffin et al. (2016), Harjito et al. (2018) apply a semiparametric regression analysis in the form of two-step GMM estimation in order to control for endogeneity between lagged dependent variables.[8] The remaining papers concentrate on simple and multiple regression analyses. As shown in Fig. 4, simple regression in frequently used in early studies, while later studies often rely on multiple regression. Ordinary least squares (OLS) procedure is the preferred method for estimating the regression parameter in both simple and multiple regression analysis. Only Olibe et al. (2008) underline their divergent usage of the minimum absolute deviations (MAD) procedure as MAD coefficients are less distorted by outlying observations than OLS coefficients. In addition, the majority of studies presume a linear relationship between multinationality and systematic risk. Only Fatemi (1984), Jung (2015), Song et al. (2017) take a curvilinear relationship into consideration.

Further differences relate to the home countries of the firms included in the respective sample (see Fig. 5). The relationship between systematic risk and multinationality is predominantly analyzed for US-based companies. This is especially the case for papers from the 1970s to the 2000s. Rare exceptions to this rule are Kwok and Reeb (2000), who base their study on firms from 32 countries worldwide, as well as Bühner (1987), Thompson (1985) with their analyses of corporations in West Germany and the United Kingdom, respectively. The most recent publications initiate an interest on the impact of multinationality on systematic risk for non-US data. However, the number of studies is small and, with the exception of Joliet and Hübner (2008) and Kwok and Reeb (2000), the regional focus is constrained to a few emerging countries. Bution et al. (2015), Bany-Ariffin et al. (2016), Harjito et al. (2018), for example, focus on Brazilian and Malaysian firms. The effect of the

[8] For further information, see Bany-Ariffin, Matemilola, Wahid and Abdullah (2016).

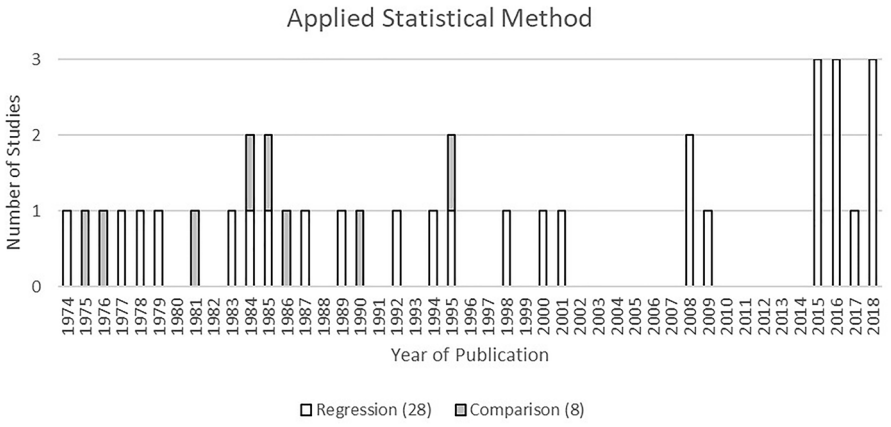

Fig. 3 Applied statistical methods

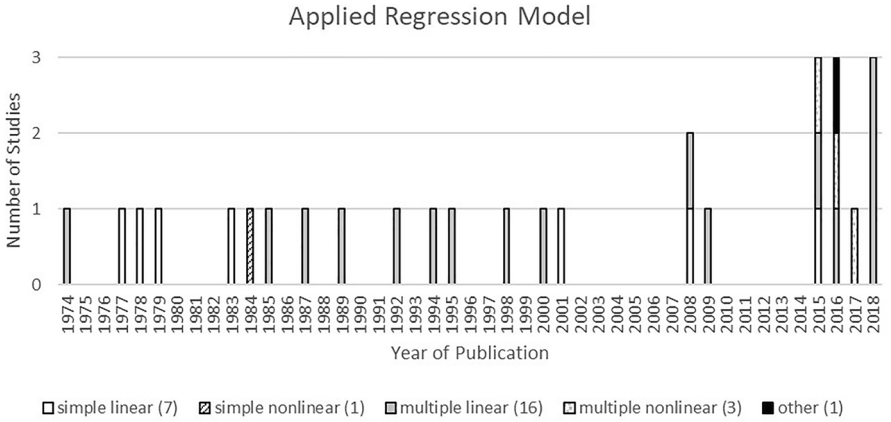

Fig. 4 Applied regression model

multinationality of firms in Indonesia, Taiwan, and Russia are analyzed by Marciano and Herlambang (2016), Shafigullin (2016), Shyu and Ou (2009).

Even though the results come from samples with the same national origin, they should be taken with caution when it comes to generalizations. For example, comparing the results of papers using U.S. data can be misleading because of the use of different data sources, beta estimates, and proxies for multinationality. Thus, the analyzed firms are selected from different sources, e.g., the New York Stock Exchange (NYSE) (Siegel et al. 1995; Theerathorn et al. 1992) or Fortune 500 list (Collins 1990; Hughes et al. 1975; Michel and Shaked 1986; Shaked 1985). This also applies to the market index used. Academic contributions focusing on US firms usually rely on data of the Center for Research in Security Prices (CRSP) (Goldberg and Heflin 1995; Olibe et al. 2008; Reeb et al. 1998) as well as NYSE (Barone 1983; Brewer

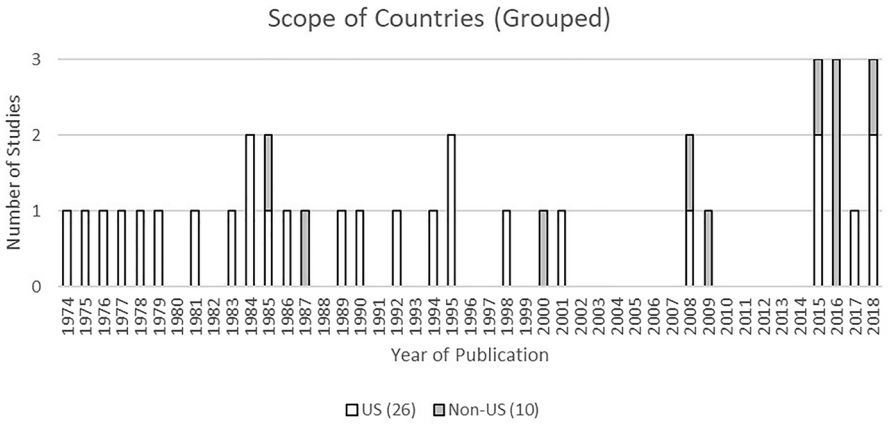

Fig. 5 Scope of countries surveyed (grouped)

1981; Broaden and Samii 2001; Fatemi 1984; Madura and Rose 1989; Michel and Shaked 1986) and the S&P index (Collins 1990; Kohers 1976; Siegel et al. 1995; Theerathorn et al. 1992). Krapl (2015), Shaked (1985) build a value-weighted U.S. market portfolio including all firms contained in their samples. In addition to the data source for the market index, the exclusive use of the domestic market as the reference portfolio has to be considered as the standard method throughout the papers of our study. Only Hughes et al. (1975), Jacquillat and Solnik (1978), Kwok and Reeb (2000) use an international market index as benchmark. Agmon and Lessard (1977) Joliet and Hübner (2008), Shyu and Ou (2009), Thompson (1985) as well as Chambliss et al. (1994) combine an analysis of systematic risk based on an international market index to the one based on the domestic market index through the application of a two-index model and multi-factor model, respectively. Bühner (1987) also considers a national and international market index within a single index model, however, concentrates on the domestic market index as the results of the regression are no more statistically significant when the international market index is used.[9] With regard to the calculation of the systematic risk, the Carhart four-factor model (Jung 2015; Jung et al. 2018a, b; Song et al. (2017) and two-index model (Amon and Lessard 1977; Joliet and Hübner 2008; Thompson 1985; Shyu and Ou 2009) are used alongside the single-index model. In contrast, Aggarwal (1979), Barone (1983), Broaden and Samii (2001), Madura and Rose (1989) refer to published betas.

Moreover, various approximations are used to determine multinationality. Nevertheless, the ratio of foreign to total sales is still the most common measure

[9] The choice of the market index could not be identified in case of Jung (2015), Jung, Dalbor and Lee (2018a, b), Jung, Kim, Kang and Kim (2018), Severn (1974) and Song, Park and Lee (2017) in case of US-data studies as well as Bany-Ariffin, Matemilola, Wahid and Abdullah (2016), Shafigullin (2016) and Marciano and Herlambang (2016) in case of non-US studies.

followed by the ratio of foreign to total assets. Referring to Goldberg and Heflin (1995), the ratio of foreign sales to total sales would generally best reflect the portion and significance of business transactions conducted in foreign countries versus total world transactions. It is the basic metric measuring the degree of foreign involvement (Nguyen 2017). This ratio is a consistent, relatively widespread, and accepted measure of foreign activities. It is publicly available in many cases and relatively unbiased by national accounting regulations (Fatemi 1984; Goldberg and Heflin 1995; Kwok and Reeb 2000). Employing the most widely used proxy also guarantees consistency with previous research (Olibe et al. 2008). Notwithstanding the numerous advantages of the foreign sales ratio, the majority of authors reject its sole usage and rely additionally on foreign assets, as foreign sales include export sales as well as foreign subsidiary sales (Kwok and Reeb 2000; Nguyen 2017; Olibe et al. 2008; Reeb et al. 1998). Further proxies often complement the measurement of international involvement. Using different measures of international involvement is preferable as each measure captures a different aspect of the complex structure of multinationality. Therefore, observing differences in effects across the measures provides valuable insight into the relationship between international involvement and risk (Krapl 2015). However, the multifaceted nature of multinationality also complicates the assessment of an overall impact of international diversification on systematic risk.

In terms of the time horizon examined, the US data studies look back a time horizon of 55 years covering data from 1959 to 2013. While Agmon and Lessard (1977) and Severn (1974) rely on the earliest US data covering a time horizon from 1959 to 1972 and 1966, respectively, Jung (2015), Jung et al. (2018a, b), Song et al. (2017) are the most recent studies covering a common period with the years 2000 to 2013. Within these 55 years, several years were analyzed by different papers simultaneously, leading to a concentration on the years 1963 to 1987. Compared with US studies, the time horizon of non-US studies from 1966 to 2015 has a similar length, though it is considerably less analyzed. Only Bühner (1987), Thompson (1985) take up the issue for non-US corporations in the early years. A greater interest has arisen in recent years. Kwok and Reeb (2000) have initiated the research focus on non-US firms with their upstream–downstream hypothesis analyzing non-US firms from 1994 to 1996.

Referring to the specific length of the period of analysis, the papers can also be assigned to different categories. Severn (1974), Song et al. (2017) select the length of their time horizon to encompass all possible economic conditions. A similar long period of seven years is also used by Bany-Ariffin et al. (2016) to generate a stable result.Agmon and Lessard (1977), Krapl (2015), in contrast, gather data for very long time periods. Since long data series raise the question of beta stability, Michel and Shaked (1986), Reeb et al. (1998), Siegel et al. (1995) take temporal stability into account by portioning the time horizon into two or more subperiods in order to test the stability of the results over time. Broaden and Samii (2001), Hughes et al. (1975), Olibe et al. (2008), Shaked (1985) as well as Bution et al. (2015), Kwok and Reeb (2000) limit the time horizon for their survey to three to five years. Harjito et al. (2018), Joliet and Hübner (2008), Marciano and Herlambang (2016), Shyu and

Ou (2009), Thompson (1985) use a similar short time horizon. Aggarwal (1979) and Barone (1983) even restrict their sample to a one-year period.

Another problem regarding measurement of multinationality concerns those studies which rely on sample comparisons. Some studies use the same measures of multinationality, but different thresholds for classification. Siegel et al. (1995), Theerathorn et al. (1992), for example, rely on the foreign tax ratio. However, since Siegel et al. (1995) apply lower thresholds for the three classification groups, results are hard to compare. Similar problems also apply to all other sample comparison papers except for the comparison between Michel and Shaked (1986) and Shaked (1985). Fatemi's (1984) classification scheme additionally leads to a discontinuity in the data spectrum, as firms with more than 25% foreign sales are referred to as multinationals and firms with no foreign operations are referred to as uninationals. Firms with foreign sales between 0 and 25% are not included at all (Siegel et al. 1995).

In contrast, for the studies using multiple regression analysis, the choice of control variables leads to differences. As pointed out by Olibe et al. (2008), several factors, e.g., size, financial leverage, international diversification, growth, and currency fluctuations, have been shown to affect a firm's systematic risk from an accounting and financial perspective. Therefore, multiple control variables should also be considered to clarify the relationship between multinationality and systematic risk. This position is also reflected in the increasing awareness of the importance to control further variables influencing the systematic risk within the papers over time. While the early regression analysis studies neglect any form of control variables, more and more control variables have been included in the studies since the mid-1980s. Thompson (1985) is the first paper that examines the effect of control variables. Subsequent studies also include additional explanatory variables in their regression analysis. However, the control variables examined differ. While Bühner (1987) examines the influence of firm ownership and growth, Madura and Rose (1989) and Theerathorn et al. (1992) consider the influence of R&D and advertising expenses. The frequent consideration of certain control variables, in detail firm size and leverage, has only been apparent since Goldberg and Heflin (1995) and later studies. With firm growth as well as profitability and liquidity, further explanatory variables have been regularly included in the analyses since 1998 and 2015, respectively.

In addition to the commonly used control variables, several recent papers include control variables previously unconsidered. For example, Bany-Ariffin et al. (2016), Harjito et al. (2018) examine the influence of firm age. Krapl (2015) adds financial distress as a control variable as distressed firms appear to have higher standard deviations and market betas than less distressed firms. Operating efficiency, dividend policy and capital intensity are just some of the other variables that are also included in the multiple regression in several studies. However, it is difficult to make a general statement about the direction and intensity of the impact of these control variables, because the results of the individual studies differ due to the inclusion of further control variables in varying combinations.

Moreover, despite seemingly identical control variables, the papers may nevertheless be not comparable due to the different measurement basis of the variables. While most papers use the logarithm of total assets as the basis for firm size, Theerathorn et al. (1992) use total sales and Shafigullin (2016), Jung (2015), Jung

et al. (2018a, b), and Jung et al. (2018a) use the logarithm of total sales. Other studies, e.g., Bany-Ariffin et al. (2016), Harjito et al. (2018), Jung et al. (2018a, b) and Theerathorn et al. (1992), deviate from the usual calculation of the leverage in form of debt ratio by using the logarithm of total debt and the debt-to-equity ratio. With regard to liquidity, two different ratios are also used equally: the quick ratio and the current ratio. This also applies to less common control variables. For example, growth prospects and dividend payout are measured by MTB (market to book) and EBIT growth, and dividend payout and dividend yield, respectively.

4.2 Results

In view of the methodological differences described above, it is not surprising that existing research provides inconsistent findings and contradictory conclusions. To allow an initial indication of the effect of multinationality on systematic risk, the papers are grouped systematically by the home country of the firms analyzed. According to the upstream–downstream hypothesis of Kwok and Reeb (2000) and considering the premise that the US market is the most stable (Kwok and Reeb 2000) we expect different effects for US and non-US studies, as the latter mainly refer to developing countries. Within US studies we furthermore distinguish concerning the statistical method of analysis (sample comparison vs. regression analysis).

4.2.1 Results of non-US studies

BANY-ARIFFIN et al. (2016) expect a negative impact of multinationality on beta for MNCs from Malaysia as outward foreign direct investments from there are often associated with lower risk. The results, however, show a positive effect of international diversification. The authors argue that a concentration of investments in the ASEAN region may provide an explanation for their findings (Bany-Ariffin et al. 2016). This presumption of a home region concentration is confirmed by Harjito et al. (2018). While firms investing only in Asia experience an increase in risk, firms investing outside are able to reduce their systematic risk thanks to asynchronous business cycles (Harjito et al. 2018). The positive effect of international diversification on systematic risk indicated by Bany-Ariffin et al. (2016) is also confirmed by Marciano and Herlambang (2016).

Marciano and Herlambang (2016) provide substantial evidence for an S-shaped relationship between multinationality and beta. In order to estimate the risk exposure to domestic and international factors, Shyu and Ou (2009) use a hybrid capital asset pricing model. The results show that foreign shareholding and psychic distance lead to less domestic systematic risk. Conversely, there is no significant effect of the foreign sales proportion on beta.

Bution et al. (2015) and Shafigullin (2016) examine the multinationality effect for firms from developing countries beyond the ASEAN region, specifically Brazil and Russia. Both papers hypothesize that systematic risk will decrease with increasing international exposure. However, their findings do not support these assumptions. Notwithstanding a significant positive effect, the small sample size of 17 firms

weakens the robustness of the results in the case of Bution et al. (2015). The results of Shafigullin (2016) are insignificant.

Thompson (1985) and Bühner (1987) instead make British and West German firms, respectively, and thus developed countries a subject of their research. The results of Thompson (1985) support the hypothesis that systematic risk declines with an increase in multinationality. The potential for risk reduction, however, may be quite small (Thompson 1985). Bühner (1987), in contrast, argues that the risk effect of multinationality appears to be contingent on growth in sales.

In order to confirm the supposed influence of multinationality in line with their upstream–downstream hypothesis, Kwok and Reeb (2000) extend their study to a worldwide sample. International involvement seems to increase systematic risk in the case of firms from more stable economies like the US but decreases the systematic risk of firms from more volatile economies. The authors also include firms based in emerging markets and discuss the influence on these markets separately. The results confirm a significant negative relationship for firms from emerging markets. Due to a substantially larger and wider dataset of firms from developed and developing countries as well as due to the different periods of analysis, the findings of Kwok and Reeb (2000) are difficult to compare with the results of Thompson (1985) and Bühner (1987). In addition, the effect on systematic risk varies according to country and industry characteristics as shown by Joliet and Hübner (2008). According to their results, inter-industry differences in systematic risk are even more pronounced than inter-country differences.

4.2.2 Results of US studies

A closer look at US studies that conduct sample comparisons reveals a significant risk-reduction effect among the papers of Fatemi (1984), Hughes et al. (1975), Michel and Shaked (1986), Shaked (1985). Brewer (1981), Kohers (1976), in contrast, find no significant evidence. Kohers (1976) even finds no evidence within an industry-specific analysis.

In contrast to the studies mentioned above, more recent papers make finer distinctions. Collins (1990) differentiates between domestic US firms and US firms with investments in developed and developing countries. He finds no significant effect for firms focusing on developed countries, but a negative effect for firms investing in developing countries. This result directly contradicts the assumption of Kwok and Reeb (2000) and points out the need for a closer look at the target countries. Theerathorn et al. (1992) as well as Siegel et al. (1995) differentiate between UNCs, MNCs, and "intermediates," firms with a degree of multinationality higher than 10% (0%) but less than 30% (21.5%).[10] Their results are contradictory as MNCs have significantly higher systematic risk according to the findings of Theerathorn et al. (1992) whereas UNCs always have the highest risk according to the findings of Siegel et al. (1995).

Similar conflicting results arise within studies based on US firms using regression analysis. Concentrating on firms from the restaurant industry, Song et al. (2017)

[10] The thresholds of Siegel et al. (1995) are reported in parentheses.

support the theory of risk reduction, as the results indicate a decrease in systematic risk through multinationality. Furthermore, a curvilinear relationship between international diversification and risk is confirmed since the risk-reduction effect diminishes as the level of diversification increases (Song et al. 2017). Jung (2015) also finds a significant negative effect on systematic risk. The effect, however, turns out to be linear. Specifically, international diversification appears to decrease restaurants' systematic risk in a lagged-linear manner. Furthermore, the risk-reduction effect is greater for limited-service restaurants than for full-service restaurants as shown by Jung et al. (2018a, b).[11] According to Jung et al. (2018a, b) it is also important to distinguish between positive corporate social responsibilities policies (CSR), e.g., organizing corporate philanthropy, and negative CSR policies, e.g. violations of desirable practice. While a significant effect of internationalization and positive CSR policies on systematic risk cannot be supported, negative CSR policies have a positive but insignificant moderating effect on the relationship between international diversification and systematic risk.

The risk-reduction effect of multinationality is also supported for studies that do not concentrate on a specific industry. The regression results of Fatemi (1984) confirm the risk-reduction effects already discovered, employing sample comparison methodology. Similar results are provided by Aggarwal (1979) and Goldberg and Heflin (1995). Referring to Goldberg and Heflin (1995), a 10% increase in DOI induces a beta decrease of 0.025.

Although the research question does not directly target the impact of multinationality on systematic risk, the results of Agmon and Lessard (1977) and Chambliss et al. (1994) point towards some potential delineations of the effect of an international involvement on the home market beta. Agmon and Lessard (1977) analyze, if investors respond to the assumed risk reduction associated by companies' foreign investments. Based on the results of a hybrid capital asset pricing model, they find that the regression coefficient of the US index is much higher for portfolios with little international involvement.

Chambliss et al. (1994) apply cross-sectional regressions in order to identify changes in US firms' systematic risk due to increased integration across European markets. An increase in foreign sales leads to a decrease in sensitivity to the US market. Parameter estimates of foreign assets and leverage are not significant. In contrast to these findings, Olibe et al. (2008), Reeb et al. (1998) provide empirical evidence that international involvement increases systematic risk. Furthermore, Theerathorn et al. (1992) are also able to validate the risk-increasing effect of international diversification discovered on the basis of a sample comparison by regression analysis. Moreover, the authors suggest an increasing integration of the world economy as firms' systematic risk decreases between earlier and more recent investigation periods. Weak differences in systematic risk for UNCs, intermediates, and MNCs during the last period of analysis (1983–1987) may indicate an increase in global market integration.

In addition to the research contributions mentioned above, there are some contributions, based on US data, which provide inconsistent results concerning the impact of

[11] Pearsons' product-moment correlation coefficient of Jung (2015) and Jung et al. (2018a, b) strengthen the theory of a risk-increasing effect contrary to the above-mentioned statement.

international diversification on systematic risk. (Krapl 2015; Madura and Rose 1989; Barone 1983; Broaden and Samii 2001; Jacquillat and Solnik 1978; Severn 1974).

In summary, it can be noted that there is no clear tendency concerning empirical results about the impact of international diversification on systematic risk. Table 2 depicts the outcome of the vote-counting method.

While empirical evidence for a significantly positive effect of multinationality on systematic risk is found in 17 studies, a significantly negative effect is shown based on the results of 15 studies. In the case of 15 other studies no significant relationship between the two variables could be found. A similar heterogeneous result is obtained for the applied proxy for multinationality as well as the applied regression method. An indication of a positive overall effect is only given for studies of firms from developing countries, where four of seven results are significantly positive. Overall, the inconsistent findings cannot be prima facie explained by certain characteristics of the studies alone. The relationship appears to be more complex and potential moderating effects have to be considered. The following univariate meta-analysis and meta-regression analysis will be used to obtain additional information about this relationship.

5 Univariate meta-analysis

5.1 Development of working hypotheses

Univariate meta-analysis evaluates[12] the results of different research papers on a particular topic through objective statistical tests and serves as a quantitative literature review. Research dimensions such as measure of research quality and model adequacy, which cannot be used in the original research studies due to the absence of variation, are used in univariate meta-analysis and meta-regression analysis in order to explain the observed variation in results (Stanley et al. 2008).

Despite the observed countervailing effects, common argumentation in IB literature based on portfolio theory posits that multinationality leads to a higher degree of cash flow stability and therefore that the risk-decreasing effects on beta are stronger than the risk-increasing effects (Doukas and Kan 2006; Gande et al. 2009). Considering this argumentation in the univariate meta-analysis, we hypothesize:

H1 Multinationality has a negative impact on systematic risk.

Nevertheless, we do not expect extant empirical results to be completely homogenous. Instead, we would expect that a certain degree of variation can be observed due to differences in the institutional environment of the home country as well as the host countries of MNCs. Kwok and Reeb (2000) argue, that it is important to differentiate between economically upstream foreign investments (i.e., lower degree of risk abroad) and economically downstream foreign

[12] See for the coining of the term and further meta-analytical methods Hansen et al. (2022).

investments (higher degree of risk abroad). They provide evidence that firms from more stable economies investing in more unstable countries might experience an increase in systematic risk whereas firms from unstable home countries investing in more stable target countries might realize a corresponding decrease in systematic risk. Their findings are further supported by Gande et al. (2009) who show that the valuation benefits from international diversification are higher if a firm invests in a country where corporate governance standards are stronger. Based on these considerations we hypothesize:

H2 Firms from countries with a low degree of risk will tend to experience an increase in systematic risk through multinationality. In contrast, firms from countries with a high degree of risk will tend to experience a decrease in systematic risk through multinationality (upstream–downstream hypothesis).

Furthermore, we would expect a certain degree of heterogeneity in empirical findings due to changes in market integration overtime. The world's financial and as well as economic markets have become increasingly integrated in recent decades (Kearney and Lucey 2004) and these changes cannot be neglected. During the early 1990s in particular, the world experienced a radical transformation towards more integration. Market reforms, liberalization, and regional and global integration like that of the European Union, especially the common market of 1992, as well as the opening up of Eastern European economies in 1990 or the formation of NAFTA in 1994 led to a removal of many barriers to the free flow of capital, restrictions on foreign ownership, and economic integration (Errunza and Miller 2000). Innovations in information and communication technology during the past few decades, starting with the invention of the Internet, have contributed to an increase in the degree of integration of financial and economic markets worldwide. The consequences of these developments are empirically well confirmed. Bordo et al. (1998) claim that in the period after 1983 financial markets worldwide "are more stably integrated than in any other" (p. 12) time period between 1880 and 1998. Albuquerque et al. (2005) find that for a sample of 94 countries' foreign direct investment inflows the contribution of global factors in explaining these inflows has substantially increased at the beginning of the 1990s. The authors explain this development with an increasing integration of financial markets worldwide. Carrieri et al. (2007) find an increasing extent of capital market integration for emerging market countries after 1990. Due to this increasing integration in capital markets which is driven by liberalizations in the global economic environment and revolutionary innovations in information and communications technology, we would expect an increasing correlation between the world's markets over time, especially since 1990. This expectation is confirmed through empirical studies. Goetzmann et al. (2005) document that international equity correlations have reached a peak in the late twentieth century and conclude that the international diversification potential should be rather low today. Bekaert et al. (2005) provide empirical evidence of increased correlation between national equity markets. Therefore, the risk-reducing effect of corporate multinationality

Table 2 Vote counting—results

	Significantly positive	Significantly negative	No significant relationship
Number of studies—total	17	15	15
Analyzed markets			
Number of studies—US	12	11	10
Number of studies—Non-US	5	4	4
Number of studies—emerging market	4	1	2
Analyzed time period			
Number of studies 1960s–1980s	8	8	7
Number of studies 1990s–2000s	9	7	8
Applied proxy for multinationality			
Number of studies—foreign sales ratio	5	5	6
Number of studies—foreign asset ratio	2	3	1
Number of Studies—other proxy	5	5	5
Applied regression method			
Number of studies—simple regression	3	5	4
Number of studies—multiple regression	8	8	8
Number of studies—other	1	0	0

Joliet and Hübner (2008), Barone (1983), Olibe et al. (2008), Madura and Rose (1989), Kwok and Reeb (2000), Krapl (2015), Jung et al. (2018a, b) and Shyu and Ou (2009) are included in the vote counting several times due to contradictory results within sub-studies or proxies

can be expected to weaken over this period due to a broader investment horizon available to investors but also an increased co-movement of economic markets. As a consequence, we would expect a weakening effect of MNCs' international diversification on systematic risk and propose:

H3 The negative impact of multinationality on systematic risk has decreased over time (capital market integration hypothesis).

5.2 Findings of sample comparison

The results of the papers using sample comparisons are analyzed by comparing the means and evaluating the significance on differences between the mean values of the samples of UNCs and MNCs. Since the identified papers investigate differences between the mean value on the systematic risk of two or more samples, we use the standardized mean difference as the effect size statistic. Referring to Borenstein et al. (2009), the standardized mean difference is estimated by

$$d = \frac{\overline{X_1} - \overline{X_2}}{SD_{within}}$$

with

$$SD_{within} = \sqrt{\frac{(n_1 - 1)SD_1^2 + (n_2 - 1)SD_2^2}{n_1 + n_2 - 2}}$$

Computation of the effect size statistics requires the means $\overline{X}$ of the two groups, the standard deviation *SD*, and the sample size *n* upon which the groups are based (Lipsey and Wilson 2000). In the case of missing values, the effect size can be estimated from other reported statistics.[13] Shaked (1985), for example, gives information on t-values for differences in means. Brewer (1981) and Theerathorn et al. (1992), however, do not provide full information in order to calculate the effect size statistics and, thus, are excluded from the analysis. Collins (1990) is removed due to the lack of comparability within the comparison groups, as the group of MNCs are differentiated between MNCs with international operation in developed countries and MNCs with international operation in developing countries. Michel and Shaked (1986) are excluded because of sample identity with the data used by Shaked (1985).

The analysis of the remaining papers suggests the use of a random-effects model as the studies included are unlikely to be functionally identical. Due to different data sources (selected companies, time horizon and proxy for multinationality) and variations in the procedures presented in Sect. 4.1, we assume that the studies do not share a common effect size, but the true effect size varies and the studies represent a random sample.[14] Thus, our goal is not to estimate one true effect, but to estimate the mean of a distribution of effects. This is confirmed by the common statistical test of homogeneity in effect sizes.[15] The Q-value of 20.053 is greater than the 0.05 critical value of 11.07 for a chi-square distribution with five degrees of freedom. Thus, the variability among the effect sizes results not merely from a subject-level sampling error, but also from notable random differences between studies (Lipsey and Wilson 2000). Furthermore, I^2, the percentage of total variation due to heterogeneity (Higgins et al. 2003), has a value of 75.066%. The application of a fixed effect model is not recommended. A random-effects model is more suitable, nevertheless, it has its imperfections in the case of a small number of studies.[16] Irrespective of this, we concentrate on the random-effects model in order to calculate the overall effect size. The required weighted mean of the effect size is computed as (Borenstein et al. 2009):

$$M^* = \frac{\sum_{i=1}^{k} W_i^* Y_i}{\sum_{i=1}^{k} W_i^*}$$

[13] See for further information Lipsey and Wilson (2000), Appendix B.

[14] See for further information Borenstein et al. (2009).

[15] The choice of model should not be based on the test for heterogeneity, which often suffers from low power. Furthermore, the random-effects analysis is reduced to a fixed-effect model if the between-studies variance turns out to be zero (Borenstein et al. 2009). See for further information and further options for handling a statistically significant test of homogeneity Lipsey and Wilson (2000).

[16] If the number of studies is very small, the estimate of the between-studies variance will have poor precision. The information needed to apply the random-effects model correctly is missing. However, the random-effects model is still the appropriate model (Borenstein et al. 2009).

with the weight assigned to each study W_i^*

$$W_i^* = \frac{1}{V_{Y_i}^*}$$

where $V_{Y_i}^*$ is the within-study variance for the study plus the between-studies variance T^2:

$$V_{Y_i}^* = V_{Y_i} + T^2$$

By including the between-studies variance T^2 we ensure that the effect sizes of all studies are represented in the summary estimate as each study provides information about a different effect size. The mean effect in a set of studies is estimated and the overall estimate is not overly influenced by few large studies. In contrast, under the fixed-effect model, the information in the smaller studies is largely ignored since the larger studies provide better information on the assumed same effect size (Borenstein et al. 2009).

Due to the small sample size, Hedges' g is used as the effect size index. Cohen's d will be upwardly biased when based on small sample sizes, particularly samples of less than 20 effect sizes. Hedges' g corrects for this bias (Borenstein et al. 2009; Glass et al. 1981; Lipsey and Wilson 2000). In doing so, we refer to the common approximation (Borenstein et al. 2009):

$$g = J \times d$$

with

$$J = 1 - \frac{3}{4df - 1}$$

Differences between the proxies of multinationality are neglected.[17] On this basis, the mean effect of international diversification on systematic risk is − 0.308 with a 95% confidence interval of − 0.529 to − 0.086 within our analyzed studies. Since the 95% confidence interval does not include zero, the estimate of the mean effect size reveals relative precision (Lipsey and Wilson 2000). If we consider the *p*-value of 0.006, the effect size is significant at the 1% level (see Fig. 6). The hypothesis of a risk-reducing effect is supported.

5.3 Findings of linear regression

In order to conduct a univariate meta-analysis of the results of simple and multivariate linear regressions, we use the correlation coefficient as effect size. We transform the correlation coefficient using Fisher's z transformation (Borenstein et al. 2009). The transformation from the correlation coefficient r to Fisher's z is given by

[17] See for further information "5.3. Finding of linear regression."

$$z = 0.5 \times ln\left(\frac{1+r}{1-r}\right)$$

Within multivariate regression, we concentrate on the product moment correlation coefficient between systematic risk and the measure of multinationality. This simplification results from differences in the scope of explanatory variables. Certain variables like firm size and leverage are used more frequently than others and are complemented by further variables to a varying extent. Equivalent partial correlation coefficients cannot be determined. The product moment correlation is obtained from correlation matrices for the majority of studies. Agmon and Lessard (1977), Joliet and Hübner (2008), Fatemi (1984), Reeb et al. (1998) do not provide sufficient information; nevertheless, we construct a correlation coefficient from the regression coefficient as the studies perform simple linear regression. We use the same procedure in the case of Jacquillat and Solnik (1978). However, the direction of the impact is inverted due to the applied proxy of domestic sales ratio. The results of Kwok and Reeb (2000), Madura and Rose (1989), Marciano and Herlambang (2016), Shyu and Ou (2009), Theerathorn et al. (1992), Thompson (1985) cannot be used as partial regression coefficients of multiple linear regression, as they are reported without any information on product moment correlation. Due to the missing standardization of partial regression coefficients and possible multicollinearity, correlation coefficients cannot be determined from the partial regression coefficients.[18]

The studies considered here employ different proxies (see Table 1) to measure the degree of multinationality. In many cases, the variety of proxies concerns the range between but also within studies. However, the outcomes of a specific study based on different measures of multinationality are not independent of each other. Treating each result as a separate outcome will again assign more weight to studies with two or more outcomes compared to studies with one outcome. Depending on the direction of the correlation, the precision of the overall effect is over- or underestimated (Borenstein et al. 2009). In order to avoid this, we compute a combined effect across the different outcomes. The combined effect size $\overline{Y}$ for m number of outcomes is computed as follows:

$$\overline{Y} = \frac{1}{m}\left(\sum_{j=1}^{m} Y_j\right)$$

with the variance of

[18] The product moment correlation coefficient of Jung et al. (2018a, b) is neglected since the sample is strictly limited to restaurants that report international diversification and CSR data. The correlation coefficient does not enable a general statement of the influence of international diversification on systematic risk. The sample will be identical to the sample of Jung et al. (2018a, b) once the limitations are removed.

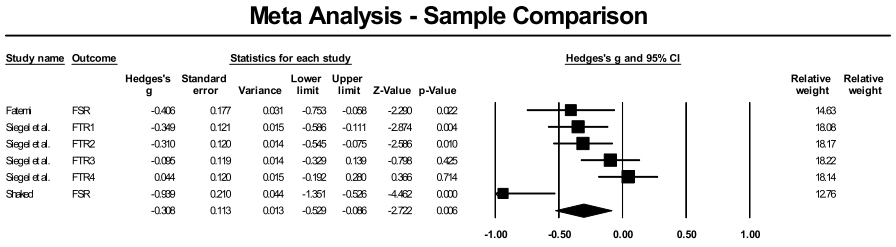

Fig. 6 Sample comparison findings—forest plot

$$V_{\bar{Y}} = \frac{1}{m} V(1 + (m - 1)r)$$

The computation of the mean effect size is based on the study's correlation coefficient and the sample size.[19] Following the same line of logic as in the case of sample comparison findings, we again apply the random-effects model because of differences in the choice of companies, time horizon and proxy for multinationality as well as discontinuous application of the different regression methods and possible control variables (see chapter 4.1). This procedure is supported by common heterogeneity tests. The Q-value of 312.604 clearly exceeds the 0.05 critical value of 26.30 for the chi-square distribution with 16 degrees of freedom. This value is supported by an I^2 of 94.882%.

Using a random-effects model, the mean effect of multinationality on systematic risk is 0.027 with a 95% confidence interval of − 0.061 to 0.114 within studies using linear regression (see Fig. 7). A risk-increasing effect of multinationality on systematic risk is supported. However, the mean effect size is not statistically significant viewing the *p*-value of 0.550.[20] In the following, we concentrate on more homogeneous subgroups. Referring to the upstream–downstream hypothesis (Kwok and Reeb 2000), we separate non-US from US data surveys as well as data from developing and developed countries. Furthermore, we form a subgroup of studies using data from the 1960s and 1980s and a subgroup of studies using data from the 1990s to the present in order to identify the possible changes of the impact due to intertemporal change in the impact of multinationality of systematic risk. Table 3 displays the results of the subgroup analyses.

Results of the subgroups of US and non-US firms are not able to provide evidence concerning the upstream–downstream hypothesis (Kwok and Reeb 2000), as

[19] The estimation of the weight assigned to each study and, thus the estimation of the weighted mean of the correlation coefficient is identical to the formulas used for the standardized mean difference above.

[20] Referring to Valentine et al. (2010), a statistically insignificant result caused by low statistical power may lead to an incorrect statistical conclusion, referred to as a "Type 2" error. The failure to reject the null hypothesis should be interpreted with caution as we currently do not have enough information to judge adequately.

the mean effect of non-US firms is positive and the mean effect for US firms is negative. Both mean effects are not significant. Dividing the sample into studies based on firms from developing countries and firms from developed countries also fails to provide support for this hypothesis. The results concerning this differentiation can be considered equivalent to the results found in the case of US and non-US firms. Hypothesis 2 cannot be supported.

Separating studies using data from the 1960s to 1980s from those using data from the 1990s to the present, we identify a shift from a risk-reducing effect to a risk-increasing effect of multinationality. This change is also confirmed when we concentrate on US firm data. Mean effect is significant in both surveys. Hypothesis 3 is supported. However, our findings are more radical than our hypothesis would lead us to expect, as the negative impact has not only decreased over time, but has turned into a positive, i.e., risk-increasing, effect.

These results are further confirmed by the outcomes of meta-regression analysis. While the regression coefficients for the moderating effects of the home countries of the firms for both US and non-US studies and developed vs. emerging market studies is not significantly related to the effect sizes, a significant moderating effect of time is found. 39% of the between-study variance can be explained considering time as a moderator variable for effect sizes. Thus, study differences concerning the impact of multinationality on systematic risk can be explained by time. However, it is possible that other influencing factors are represented by the moderator variable time. With reference to the narrative literature review, the identified effect could also be the consequence of other reasons like specific methodological properties of the underlying studies.

Possible properties are the regression type and the internationalization measure. Since considering for the internationalization measure leads to a further reduction of the data sample from 17 to 12 studies, we run a meta-regression analysis without internationalization measure as moderator variable (n = 17) and a meta-regression analysis with internationalization measure as moderator variable (n = 12) to avoid a general reduction of our database. If the internationalization measure is neglected, a significant moderating effect of the regression type emerges, as 26% of the variance between studies can be explained by it. Taking the other moderator variables into account, the explanatory power is as high as 62% and the regression coefficients for firms' national origin,[21] time and regression type are significant (see Table 4).

Including the internationalization measure as a moderator variable, both firms' origin and the time are significant moderator variables and contribute to an explanation of the between-study variance with an explanatory power of 7 and 9%, respectively. In contrast, both the regression type and the internationalization measure have no explanatory power when considered alone.

[21] Since 12 of the 13 studies with companies from developed countries are at the same time studies with U.S. companies and thus biased results due to collinearity cannot be excluded, only the moderation effect of the property of developed and developing market is analyzed in the regression analysis.

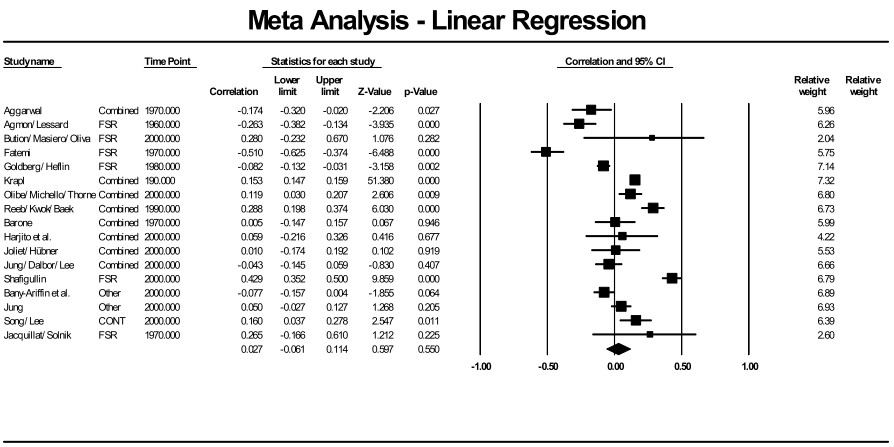

Fig. 7 Regression analysis findings—forest plot

Table 3 Linear regression analysis—analysis results of subgroups

Data origin	Time period	Effect size	Test of null *P*-Value	Q	df(Q)	I^2
Total	1960s–1980s	− 0.170	0.034**	38.917	5	87.152
Total	1990s–2000s	0.128	0.002***	106.833	10	90.640
US	Total	− 0.010	0.839	235.900	11	95.337
US	1960s–1980s	− 0.170	0.034**	38.917	5	87.152
US	1990s–2000s	0.123	0.001***	30.049	5	83.361
Non-US	Total	0.138	0.354	76.688	4	94.784
Developed	Total	− 0.009	0.855	238.047	12	94.959
Developed	1960s–1980s	− 0.170	0.034**	38.917	5	87.152
Developed	1990s–2000s	0.114	0.001***	32.363	6	81.460
Developing	Total	0.174	0.344	74.445	3	95.970

, * Indicate that the result is significant at 5, and 1% levels, respectively

We did not differentiate between the 1960s–1980s and 1990s–2000s subgroups in studies using data from non-US and developing countries since these studies only cover the time from 1990s to the present

However, when all moderator variables are included in the regression model again simultaneously, the moderator variables time, regression type, and internationalization measure are significant and have an explanatory power of 70% for the between-study variance (see Table 5).

6 Discussion and implications

In this paper we analyzed extant research on the impact of corporate multinationality on systematic risk. Based on the literature of modern portfolio theory and further theoretical considerations on its adaptation on international firm

Table 4 Results of meta-regression analysis

	Model 1	Model 2	Model 3	Model4
Intercept	− 0.0110	− 0.0096	− 0.1769***	− 0.1424**
US/ Non-US [Non-US]	0.1473			
Developed/ Emerging [Emerging]		0.1812		
Time [90/00er]			0.3053***	
RegTyp: [MR]				0.2749***
RegTyp: [other]				0.0653
T^2	0.0324	0.0322	0.0170	0.0205
R^2 between-study variance	0.00	0.00	0.39	0.26
Number of studies	17	17	17	17

	Model 1	Model 2	Model 3	Model4	Model 5
Intercept	− 0.0864	− 0.0748	− 0.2112*	− 0.1343	− 0.0177
US/ Non-US [Non-US]	0.12231				
Developed/ Emerging [Emerging]		0.2470*			
Time [90/00er]			0.3131**		
RegTyp: [MR]				0.2356	
RegTyp: [other]				0.0571	
INT measure [other]					0.0455
T^2	0.0452	0.0448	0.0437	0.0491	0.0605
R^2 between-study variance	0.06	0.07	0.09	0.00	0.00
Number of studies	12	12	12	12	12

*, **, ***Indicate that the result is significant at 10, 5, and 1% levels, respectively

diversification we hypothesized that there is an overall negative relationship between multinationality and systematic risk. This hypothesis cannot be convincingly supported. A negative impact of multinationality on systematic risk can only be confirmed in the case of those studies based on sample comparisons. Considering the studies employing linear regression methodology, we find a positive, but insignificant effect. There seems to be quite an amount of underlying heterogeneity. Potential moderators have to be considered. One concerns the multinational firm's country of origin. However, we find no significant difference between multinational firms from the US and those from non-US countries. We are also unable to establish significant differences between multinational firms from developing countries and multinational firms from developed countries. Our results are therefore not able to support Kwok and Reeb's upstream–downstream hypothesis (Kwok and Reeb 2000). However, we recommend that our findings be interpreted carefully. On the one hand, certain sub-samples depict results that support the upstream–downstream hypothesis, like the sample of US studies from 1990 on. On the other hand, the differentiation between US firms and non-US firms, as well as between firms from developing countries and firms

Table 5 Results of Meta-Regression—stepwise Regression Analysis

	Model 1	Model 2	Model 3
Intercept	− 0.0096	− 0.1751**	− 0.2086***
US/ Non-US [Non-US]			
Developed/ Emerging [Emerging]	0.1812	0.0613	0.2244**
Time [90/00er]		0.2853***	0.2153**
RegTyp: [MR]			0.1170
RegTyp: [other]			− 0.3082*
T^2	0.0322	0.0214	0.0106
R^2 between-study variance	0.00	0.23	0.62
Number of studies	17	17	17

	Model 1	Model 2	Model 3	Model 4
Intercept	− 0.0748	− 0.2081*	− 0.2688***	− 0.3242***
US/ Non-US [Non-US]				
Developed/ Emerging [Emerging]	0.2470*	0.1278	0.2599**	0.1083
Time [90/00er]		0.2527	0.2154*	0.3929***
RegTyp: [MR]			0.1238	0.2608**
RegTyp: [other]			− 0.2836	0.0364
INT measure [FSR]				− 0.2907*
T^2	0.0448	0.0500	0.0195	0.0144
R^2 between-study variance	0.07	0.00	0.59	0.70
Number of studies	12	12	12	12

*, **, ***Indicate that the result is significant at 10, 5, and 1% levels, respectively

from developed countries, represent rather crude measures for a test of Kwok and Reeb's hypothesis (Kwok and Reeb 2000).

Furthermore, we assume that the risk-reducing effect of multinationality has weakened over the period of analysis, especially since the beginning of the 1990s. Our empirical results suggest that the development has been even more radical. Whereas we are able to confirm a risk-reducing effect of multinationality for the time period up to 1990, we find a risk increasing effect of multinationality for the period from 1990 onwards.

We assume that these results can be attributed on the one hand to the increasing international integration of national capital markets and henceforth the increasing correlations between them. As a consequence, portfolio diversification benefits of firm internationalization as well as country-specific effect differences decrease since the countries are increasingly exposed to the same risks. And, on the other hand these results can be attributed to the overwhelmingly dominant methodological practice to rely on a national market index as the reference for estimating the systematic risk of a firm. The view of limited investment opportunities within national borders, however, cannot be further recommended in light of the increasing capital

market integration. Nevertheless, the choice of market index cannot fully explain the change in the effect. Investors seems to assign a higher risk to firms multinationality.

Notwithstanding the early stage of this research object, our results can be used to provide a first hint to the true effect of international diversification on firms' systematic risk and, thus, capital market value. Our results, nevertheless, require further analyses as the small number of previous studies and the underlying methodological variety indicate limitations. This is also confirmed by the meta-regression analysis results, where time is found to be a significant moderator variable, but other study characteristics, such as regression type, also seem to have an impact on the effect. In order to enable a reliable statement on the risk-reducing effect over time, academic research also has to provide new empirical results based on systematic risk estimates using international reference markets. Furthermore, a more sophisticated view of the relationship between the geographical structure of multinational firms and systematic risk seems to be necessary in order to provide more insight regarding the upstream–downstream theory. Verbeke and Brugman (2009) argue that there is an important difference between the degree of internationalization and the degree of international diversification within multinationality. While the degree of internationalization is related to the firm's international expansion, the degree of international diversification is related to the firm's geographic dispersion. Despite of the relationship between internationalization and international diversification, the impact of international expansion on systematic risk can be expected to be different depending on the level of geographic dispersion. The majority of the studies considered, nevertheless, refer to proxies measuring international expansion. Similar to Li's (2007) point about the research on the relationship between multinationality and performance, a parallel consideration of several operationalizations of multinationality in regression analyses is also a promising research perspective. Using the common measures, e.g., foreign sales ratio or foreign asset ratio, in isolation can only capture part of the multinational phenomenon.

For comparative purposes, future analyses should still be based on similar procedures and comparative data. However, it is recommended to further enlarge analyses and to go into detail referring to the recent findings. The question of a curvilinear relationship, for example, needs further investigation since Song et al. (2017) finds evidence while Fatemi (1984), Jung (2015) cannot verify it. Furthermore, research should expand the idea of Jung (2015), Song et al. (2017) and investigate whether the results would differ across different industries, different types of MNCs and further possible moderating variables. Referring to Collins (1990), the difference between past studies may be due to sample specific differences in the level of involvement of the sample MNCs in developing countries. In view of this, separate analyses of investments in developing and developed countries should be deepened, too. Besides extending the common procedure, procedures of similar research questions may be helpful in assessing the impact of multinationality on systematic risk. Morck and Yeung (1992), for example, examines stock price reaction to announcements of foreign acquisitions through an event study test. This methodology is an alternative, however, raises several difficulties (Goldberg and Heflin 1995; Binder 1998; McWilliams et al. 1999).

Moreover, our findings also have practical implications. It is common practice in the course of company valuations to use betas of peer companies and adjust them according to the company specifics. Our findings show that adjustments that were appropriate in the past based on portfolio theory do not seem to be appropriate any more. In the case of multinationality, betas need to be adjusted upward rather than downward. Contrary to current expectations, the additional risks associated with multinationality outweigh the potential reduction in variations of earnings. Executives should therefore carefully consider their internationalization steps, if they intent to increase firm's capital market value through risk diversification.

Appendix

Robustness test

While univariate meta-analysis supports a change concerning the effect of multinationality on systematic risk: from risk-reducing to risk-increasing, a final inference must await further evaluation of the reliability of these results. In this context, the problem of publication bias has to be considered due to a conceivably too small scope of studies. If the identified studies are a biased sample of all relevant studies, the mean effect computed will reflect this bias (Borenstein et al. 2009). In order to accept or reject the existence of the publication bias, we refer to the visual identification by funnel plot asymmetry with the help of funnel plots with standard error at the vertical axis as measure of study precision.[22] In addition to the graphical analysis, we perform an Egger test in order to avoid a subjective conclusion on asymmetry. However, the Egger test is limited to studies of regression analysis using data from the 1990s to the present, as the number of sample comparison studies and the number of linear regression studies from 1960 and 1980s are too small.[23]

A closer look at Fig. 8 demonstrates that the effect sizes of sample comparison studies are within or near the 95% confidence limits around the mean effect centered around the middle of the funnel plot. In case of a symmetrical funnel plot effect sizes will spread uniformly within the 95% confidence limits as effect sizes from smaller studies will scatter more widely at the bottom of the 95% confidence limits with a spread narrowing with increasing precision among larger studies (Sterne and Egger 2001). Larger and smaller study sizes seem underrepresented. Funnel plot asymmetry can be assumed. Small sample size, however, impedes further analysis. This is different for the case of studies employing linear regression methodology. As can be seen in Fig. 9, these studies are centered around the top of the plot and

[22] As recommended by Sterne and Egger (2001, p. 1053).

[23] Stanley et al. (2008) illustrate how a meta-regression model can capture the problem of publication bias by making standard error an important independent variable in the model. However, due to the need to average the effect sizes of several studies, there is a further reduction in sample size, so this approach was not considered further.

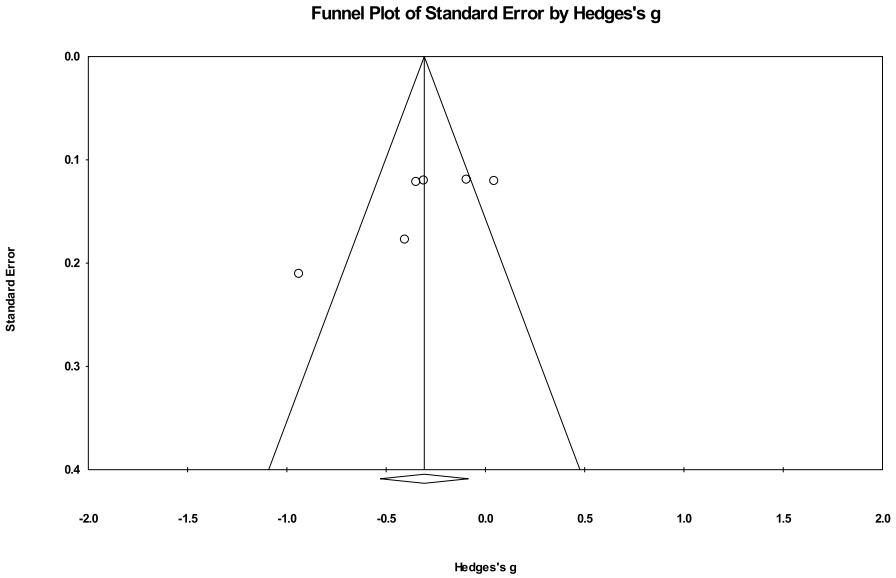

Fig. 8 Sample comparison findings—funnel plot

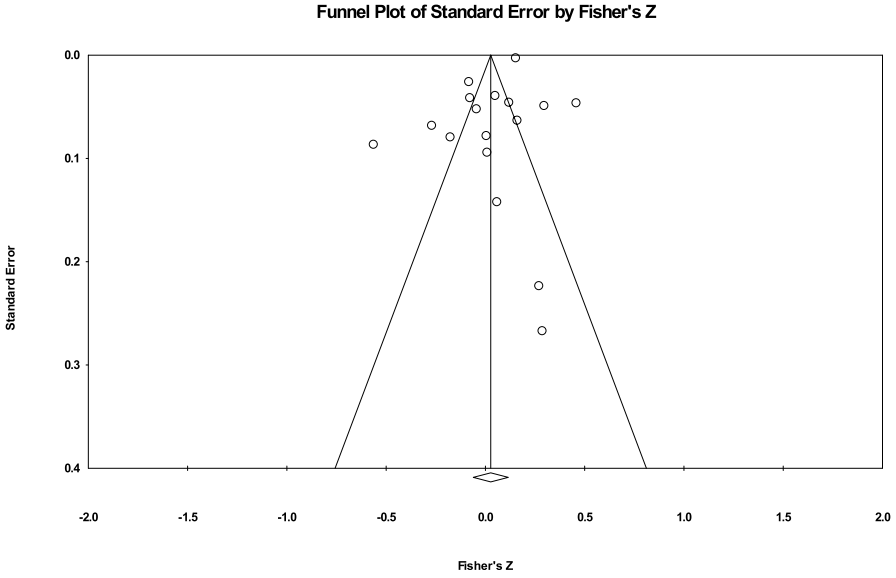

Fig. 9 Regression analysis findings—funnel plot

several studies are outside the 95% confidence limits around the mean effect.[24] The graphical impression of the funnel plot asymmetry is now confirmed by an Egger test since intercept β_0 having a value of − 2.16764 deviates significantly from zero (two-sided p-value: 0.06459). The asymmetry in the funnel plot, however, can be caused by further sources than a publication bias, for instance a true heterogeneity in results.[25] An explanation of true heterogeneity is supported by the studies' horizontal distribution and an improvement of funnel plot asymmetry through the establishment of subgroups. Concentrating on studies using data from the 1990s to the present, we estimate an insignificant Egger test intercept β_0 of − 0.49728 (two-sided p-value: 0.67558). In light of the above, we assume that true heterogeneity made an important contribution to the funnel plots' asymmetry.

Based on these results, we conclude that the mean effect of the subgroup of linear regression studies from the 1990s to the present is not affected by publication bias and, thus, represents a reliable reflection of the true impact of multinationality on systematic risk. Although funnel plot asymmetry cannot be denied for sample comparison studies as well as for the subgroup of linear regression studies from 1960 to the 1980s, we assume robustness of the direction of the mean effects because of their statistical significance and an almost unambiguous direction of the single effect sizes.

Author contributions Both authors contributed to the study conception and design. Material preparation, data collection and analysis were performed by CH-J. The first draft of the manuscript was written by CH-J and SE. Both authors commented on previous versions of the manuscript. Both authors read and approved the final manuscript.

Funding Open Access funding enabled and organized by Projekt DEAL. This research did not receive any specific grant from funding agencies in the public, commercial, or not-for profit sectors.

Data availability The dataset generated and analyzed during this study is available from the corresponding author upon request.

Declarations

Conflict of interest The authors have no relevant financial or non-financial interests to disclose.

[24] See for further information on design and interpretation of a funnel plot Sterne and Harbord (2004).

[25] See for further information Egger et al. (1997).

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