

## Different ways of defining and measuring company size when studying its effects on OHS: a literature study

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**Abstract.** Company size is a proxy variable for other variables affecting occupational health and safety (OHS) performance. The aim of this literature study was twofold: to give an overview on how it empirically has been shown that smaller and larger companies differ from one another in terms of OHS, and to present how earlier studies have defined company size when studying its effects on OHS. Earlier studies show for example that the OHS standard improves as company size increases. Number of employees was the most common way to define company size. Ordinal scale data was the most commonly used scale-of-measure.

**Keywords.** Company size, Proxy variable, Occupational health and safety (OHS), Ergonomics.

### 1. Introduction

It is not company size per se that is responsible for differences between companies, but rather other mediating variables, like organizational structure, management, and resources, that change when companies grow in size (Beer, 1964). Company size is therefore an approximation, or proxy variable, for other variables affecting occupational health and safety (OHS) performance.

Quality and extent of OHS management vary between companies. Employers are, however, required to follow national legislation and associated regulations governing how a safe and healthy work environment should be systematically planned and implemented, for example, Swedish legislation and regulations (AFS, 2001; SFS, 1977), or European (89/391/ECC). Hopefully, companies choose to meet the legislated requirements of a satisfying work environment. In addition, some companies choose to invest even further in their work environments by using workplace health promotion. In other words, different companies prioritize their work environments in different ways, and different aspects may also be emphasized.

A definition of company size set by the European Union divides companies into micro-, small-, and medium-sized enterprises (collectively termed SMEs) (Commission of the European Communities, 2003). The main criterion for this definition is *staff headcount*, but *balance sheet*, and/or *annual turnover* is also used to classify a company to one of the size categories. The size categories are defined as follows: **micro** enterprise: staff < 10, turnover ≤ € 2 million, and/or balance sheet ≤ € 2 million; **small** enterprise: staff < 50, turnover ≤ € 10 million, and/or balance sheet ≤ € 10 million; **medium-sized** enterprise: staff < 250, turnover ≤ € 50 million, and/or balance sheet ≤ € 43 million (Commission of the European

Communities, 2003). A **large** enterprise is then a company with more staff, turnover, and/or balance sheet than an SME.

However, other (but similar) definitions and cutoffs for classifying company sizes are being used around the world, in research and other contexts. It is of importance to reflect upon how company size, and its categories, is used as a variable in research when investigating its effects on OHS. A common notion is that company size influences OHS performance. There are earlier studies that demonstrate this empirically, which this literature study aims to review.

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## 2. Methods

A systematic and flexible search strategy was used for this literature study during April 2012. The emphasis was on the search terms *OHS* and *company size* and relevant synonyms to these terms. The databases of PubMed, Web of knowledge, Scopus, and Scirus were used in the searches, as well as going through the reference list of appropriate studies recovered. Google Scholar was used as a search complement. The criterion for relevance was if the study had investigated some type of association between company size and OHS variables. A total of 29 articles were reviewed.

## 3. Results

### 3.1 Differences in OHS depending on company size

The overview of what empirically has been shown on company size differences in terms of OHS resulted in ten different themes (1–10).

(1) OHS is poor in small companies compared to large companies. Larger companies have a more developed internal control system for systematic OHS management (Torp & Moen, 2006; Øystein Saksvik, Torvatn, & Nytrø, 2003). Small companies have poor OHS management (Hasle, Bach, Sørensen, & Roepstorff, 2005). The safety climate is better in larger companies compared to smaller (Garcia, Boix, & Canosa, 2004; Ma & Yuan, 2009). Companies with more than 100 employees are almost twice as likely to have implemented health promotional programs as companies with fewer than 100 employees (Wilson, DeJoy, Jorgensen, & Crump, 1999). At companies using solvent substances, the worker exposure to solvent vapor concentrations in the air is lower in larger companies (Ukai et al., 2006). In terms of vulnerability in the physical work environment, the least favorable work environments are found in small and privately owned enterprises (Hasle et al., 2005). In contrast, the psychosocial work environment is better in small firms than in large (Hasle et al., 2005).

(2) The OHS standard improves as company size increases. OHS management activity appears to gradually improve as there are increases in company size, resources, and incentives for OHS management (Champoux & Brun, 2003). The prevalence of workplace assessments increases respectively as the company size increases (Sønderstrup-Andersen, Flöcke, Mikkelsen, & Roepstorff, 2010). Wilson, Jr., and Koehn (2000) suggest as a generalization that “emphasis on safety is proportionate to the size of the company.”

(3) It is less common for small companies than for large companies to use formal practices. It is more common for small companies to use informal or non-systematic OHS systems than advanced ones (Arocena & Nunez, 2010). Strategic management concepts based on

large business conditions do not fit small companies very well (Rantakyrö, 2000), and formal practices are less frequent in smaller companies (Forth, Bewley, & Bryson, 2006). Companies spend about the same percentage of their turnover on internal projects regardless of company size, but being a small-sized company means undertaking small-sized projects and therefore being less likely to use project management and project management tools and techniques (Turner, Ledwith, & Kelly, 2009).

(4) However, if small companies use formal practices, there are positive effects. Smaller companies that are subcontractors and affiliated with a large company, and which maintain a systematic OHS management with activities like health checkups, OHS committee meetings, and educational activities for OHS, have a worker health status not inferior to that of large companies (Yamataki et al., 2006).

(5) There is an inverse relationship between company size and injury frequency. The risk for occupational accidents is lower in large companies (Salminen, 1993). Injury occurrences are lower in larger building construction projects (Hinze & Raboud, 1988). The injury frequency decreases as the company size increases (McVittie, Banikin, & Brocklebank, 1997). The total number of accidents as well as the number of fatal accidents declines with the increase of company size, and there is an inverse relationship between the frequency of injuries and company size (Fabiano, Currò, & Pastorino, 2004). Smaller companies' managers perceive that the main reason that large companies have fewer accidents is that they have better financial resources for safety, and more knowledge, since they can pay for full-time safety experts (Salminen, 1998).

(6) Larger companies tend to offer some employment advantages over small companies. Security against dismissal is strong in large companies, but declines correspondingly with a decrease in company size (Gallie, 2003). Paid training by the employer is more common as the size of the company increases (Gallie, 2003).

(7) Another difference related to company sizes is that the rate of absenteeism is lower in small companies (Forth et al., 2006).

(8) There are better opportunities to influence one's own work situation in smaller companies than in large companies. The manager–employee relationship is better in small companies, and employees feel that they can influence the final decisions of managers (Forth et al., 2006). Participation in decision-making is more common in smaller companies (Gallie, 2003). Employees in large companies experience less autonomy on the job (Kalleberg & Van Buren, 1996). Employees in small companies perceive greater job autonomy, job security, and organizational commitment as well as greater general well-being than employees in larger companies (Forth et al., 2006).

(9) There is an inverse relationship between company size and job satisfaction. Lower levels of job satisfaction are found in larger companies and can be explained by inflexibilities in the structure of work (Idson, 1990). Organizational size is inversely related to job satisfaction (Beer, 1964).

(10) Some things do not appear to differ depending on company size. Intention to quit have not been found to differ between company sizes (García-Serrano, 2011). There is no difference between company sizes in how important human resource management is perceived to be (Deshpande & Golhar, 1994). Findings by Harms-Ringdahl et al.'s (2000) indicate more similarities than differences between small and large companies when comparing variables of safety, health, and environment.

The main body of earlier studies demonstrates differences in OHS between company sizes in some way or another. For further reading, the situation for small companies' OHS is well described in reviews by Mayhew (2002) and Hasle and Limborg (2006).

Author	Definition		
		2004	30, 31–100, 101–250, >250
<i>Ordinal data variable, named categories of number of employees</i>			
Arocena & Nunez, 2010	Small = <50 Medium = 50–250	García-Serrano, 2011	Small–Large = 10–49, 50–99, 100–499, >500
Champoux & Brun, 2003	Small = <50		
Forth et al., 2006	SMEs = <250 Small = <50 Medium = 50–249 Large = >250	Harms-Ringdahl et al., 2000	Small = <100 Range within Small presented = 0–20, 21–40, 41–60, 61–80, 81–100, 101–110 Large = not presented, maybe >100
Deshpande & Golhar, 1994	Small = <500 Large = >500	Hasle et al., 2005	Small = <50 Small–Large = 1–4, 5–19, 20–49, 50–99, 100–249, >250
Garcia et al., 2009	Small = <50 Medium = 51–200 Large = >200	Kalleberg & Van Buren, 1996	Small–Large = 1–9, 10–49, 50–99, 100–499, 500–999, 1,000–4,999, >5,000
Hasle & Limborg, 2006	Small = <50	McVittie et al., 1997	Range in Small–Large = <1, 1–3, 4–7, 8–15, 16–25, 26–50, 51–100, >100
Mayhew, 2002	Micro = <5 Small = <20	Salminen, 1993	Small–Large = 1–9, 10–49, 50–199, 200–499, 500–999, >1000 Fixed categories used as well: Small = <10 Medium = 10–499 Large = >500
Rantakyrö, 2000	Small = 3–50	Sönderstrup-Andersen et al., 2010	Small–Large = 1–4, 5–19, >20
Salminen, 1998	SMEs = <250 Small = <250 Large = >250		
Torp & Moen, 2006	SMEs = used, not defined Small = <10 Medium = 10–29 Large = >30		
Turner et al., 2009	SMEs = <250 Micro = <10 Small = <50 Medium = <250		
Ukai et al., 2006	Small to Medium (SM) = <300 Large = >300		
Wilson et al., 1999	Small = 15–99 Large = >100		
Yamataki et al., 2006	Small = 1–49 Medium = 50–299 Large = 300–1,000 & 1,000–2,999		
<i>Ordinal data variable, range of categories of number of employees</i>			
Fabiano et al.,	Small–Large = 1–		
<i>Ordinal data variable, range of categories of man-labor years</i>			

Øystein Saksvik et al., 2003      Small–Large = <5,  
 5–10, 11–20, 21–  
 50, 51–100, >100

*Ratio data variable, range of  
 number of employees*

Gallie, 2003      Named categories  
 used as well:  
 Small = <50  
 Large = >50

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Idson, 1990      Definition used as  
 well:  
 Range of Small–  
 Large

*Ratio data variable, range of contractors’  
 annual volume of business*

Hinze & Raboud, 1988      Range =  
 \$60,000,000–\$1  
 billion (Canadian  
 Dollars)

*Other: Small and Large, number of  
 employees not specified*

Beer, 1964      Small and Large

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Ma & Yuan, 2009      Small and Large

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Wilson, Jr. & Koehn, 2000      Small and Large

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### 3.2 Definitions of company size when studying its effects on OHS

The majority of the examined studies under the previous heading were similar, in that they found differences attributed to company size. They differed, however, in the ways they defined company size as a variable in analysis. Table 1 lists the examined studies with their definitions of company size.

To define company size as *number of employees* was the most commonly used approach (27 out of 29 studies). One study used *number of man-labor years* as definition. One study used the *contractors' annual volume of business in dollars* as definition. Most commonly, the *ordinal scale* was used to measure company size (23 out of 29 studies). Three studies used *ratio scales*. Three studies did not specify scale of measurement. Among the studies using ordinal scale data (23), two approaches can be observed, to name every category (14 out of 23 studies), or to use a range of different categories that were not named (9 out of 23 studies) (see Table 1).

### 3.3 Discussion and Conclusions

This literature study gave an overview on how it empirically has been shown that smaller and larger companies differ from one another in terms of OHS, and presented ten different themes on this matter. The main body of earlier studies demonstrates differences in OHS performance between smaller and larger companies in some way or another.

This study also presented how earlier studies have defined company size as a variable when studying its effects on OHS. It showed that *number of employees* was the most commonly used approach to define company size. It also showed that ordinal scales were the most commonly used *to measure company size*. In earlier studies that used ordinal scales, two approaches were observed, either to name every category being used or to use a range of unnamed categories.

Company size is a proxy variable for other mediating variables affecting OHS performance. Turner et al. (2009) demonstrated that regardless of size, companies spend about the same percentage of their turnover on internal projects, but that smaller company size means that projects are smaller, and project management and related tools and techniques therefore are less likely to be used. Considering this circumstance with respect to companies' priorities of OHS, one could imagine that companies of various sizes spend an equal amount of their financial resources, as a percentage, on OHS, and that this therefore may be reflected in many of the differences observed in studies.

For future research it is recommended to carefully consider what *definition* and *scale of measure* to use for the sake of studying the effects of company size on OHS. Some of the less commonly used alternatives could be relevant. Company size is an important proxy variable to study further in order to better understand what factors that enable and obstruct safe and healthy workplaces.

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