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Are public listed companies losing their influence on the economy?

An analysis of the role of listed companies in the Nordic economy

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Abstract

Listed companies in the Nordics contribute more to employment and GDP now than in 1990. Part of this growth can be attributed to the increase in employment in sectors such as manufacturing, services, wholesale and retail, transportation, & electricity. Although the market capitalization of a company is less reflective of its employment contributions, it remains a consistent indicator of value added. The largest listed firms have become increasingly dominant in value creation, even as their share of employment has remained stable.

Contents

List of Figures

List of Tables

1 Introduction

The US stock market continues to reach new all-time highs, delivering significant returns to investors. However, behind these record valuations lies a contrasting trend: the number of publicly listed companies has fallen sharply[1], raising concerns that listed companies are losing their importance in the overall economy. Recent studies support this, showing that listed companies now contribute less to employment and value creation compared to the past decades[2]. In contrast, we find that listed companies in the Nordics have seen their economic impact increase since 1990. As the stock market serves as an indicator of economic health, influencing investment decisions and policy decisions, the changing role of listed companies raises an important question: Are listed companies still representative of the broader economy?

This study examines the contribution of publicly listed companies in the Nordic region - covering Sweden, Norway, Denmark, and Finland - from 1990 to 2023. We examine the direct contributions of listed companies to Nordic employment and Gross Domestic Product (GDP). Our findings reveal that listed companies have increased their economic impact over this period, contributing more to both employment and GDP in 2023 compared to 1990. This trend also holds after accounting for foreign affiliates, though the increase is less pronounced. Our sector analysis highlights the service sector as the main driver of growth, reflecting its growing importance in the broader economy and the increasing number of listed service companies. In addition, we examine how market capitalization reflects a company's economic contribution. Although its relationship with value added remains stable, market capitalization has become a less reliable indicator of employment contribution. Lastly, we evaluated the role of the largest company in the economy and found that its influence, both in employment and value added, has grown since 1990.

To find the contribution of listed companies to the economy, we measure employment and value added. Employment and GDP are indicators of economic health because they capture key aspects of economic activity and labor market conditions over time. We have access to employment data for listed companies, but value added is not reported. We calculate value added by adding labor costs to operating income before depreciation for every company annually. This approach captures the total contribution of each company to GDP annually. As many companies do not disclose labor costs, we estimate it by multiplying the number of employees by the industry median cost per employee. From 1990 to 2023, the share of total Nordic employment of publicly listed

[1] Doidge et al. (2017)
[2] Schlingemann and Stulz (2022)

companies increased from 11% to 25%, while their contribution to GDP increased from 13% to 33%. This reflects a growing contribution from listed companies to the Nordic economy. Although the economic contribution of listed companies has increased in the Nordics, compared to a decline in the United States, the trends between 1990 and 2019, when both regions have overlapping data, appear relatively similar. Both regions experienced steady growth during the 1990s, followed by a flattening trend after the early 2000s. However, while the United States has seen a slight decline in the economic contribution of listed companies since the 2000s, the Nordics maintained a flat trend before experiencing a noticeable upswing after 2019, with listed companies increasing their contributions to both employment and GDP.

Many listed companies have expanded internationally and have foreign affiliates with foreign employees, income, and costs, leading to an overestimation of their contribution to the domestic economy. To compensate for this, we have collected information about foreign activities. First, we manually adjusted the 30 companies with the most employees, which together represent more than half of the total employees in the data. The remaining companies are classified into different sectors and sizes and adjusted using a weighted average between sector and market capitalization. In this way, we precisely adjusted the most influential companies while accounting for variations in the proportion of Nordic employees across different sectors and company sizes. Our analysis shows a growing importance for foreign subsidiaries, with foreign employment in listed companies increasing from 38% to 55% and their contribution to Nordic GDP increasing from 27% to 45% between 1990 and 2023. After adjusting for foreign affiliates, the growth in domestic employment of listed companies is more modest, increasing from 7% in 1990 to 11% in 2023, while the value added increased from 9% to 18%. The adjusted figures highlight a positive but more modest growth in the domestic contributions of publicly listed firms to the Nordic economy. Foreign multinational companies, such as Microsoft, also employ people in the Nordic region, extending the influence of listed companies beyond the domestic figures presented here. Therefore, these figures represent a lower bound of the impact of listed companies on the Nordic economy.

To better understand the growth in economic contribution by listed companies, we explore the role of different sectors in the Nordic economy. We categorize all companies into sectors and analyze trends in sector employment and the proportion of employment in listed firms. We developed a shift-share analysis that broke down growth into two components: changes driven by listed firms within each sector and changes resulting from overall sector trends. We find that listed global employment of Nordic employment increased by 12 percentage points between 1993 and 2023, with the most significant increase occurring between 1993 and 2000. All sectors experienced a

growth in the share of listed employment, with the largest increases in manufacturing, services, wholesale, retail, transportation & electricity.

After analyzing the employment and value-added contributions of listed firms, we examine how market capitalization represents a company's economic contribution. Understanding this relationship is valuable because market capitalization is often seen as a reflection of economic importance. To explore this, we developed an unrepresentativeness measure for both employment and value added. For employment unrepresentativeness, we calculated the absolute difference between a company's share of total market capitalization and its share of global employment. Similarly, value-added unrepresentativeness was measured as the absolute difference between a firm's market capitalization share and its share of total value-added. In addition, we examine how well market capitalization explains employment and value-added contributions by tracking the changes in explanatory power over the years. The results show that the unrepresentativeness of employment increased since 1990, while the unrepresentativeness of value added has remained at the same level. We observe high unrepresentativeness values during the dot-com bubble, the financial crisis, and post-2020, indicating periods of increasing disconnect between market capitalization and economic contributions. We also find that the ability of market capitalization to explain employment contributions is now at its lowest point since the 1990s. For value added, the explanatory power has improved, but remains lower than its peak levels. These findings suggest that market capitalization has become a less reliable indicator of a firm's contribution to employment, while its connection to value-added remains stable.

Lastly, we examine how the importance of the largest listed companies has evolved over time. This perspective offers insight into the concentration of economic influence among few dominant companies and helps us understand how changes among the largest companies shape the broader economy. We find that since 1987, only six companies have been the largest company by market capitalization, but none have been larger or more dominant for as long as Novo Nordisk. The global employment share of the largest company relative to total Nordic employment was higher in the 2000s compared to today, and the global value added by the largest company peaked in the years around 2010. However, the largest company's share of employment and value added has grown since 1990. This suggests that while the influence of the largest firm has fluctuated, it has increased over the past decade, indicating that the largest firm is more important. However, the ten largest companies contributed as much to employment in 2023 as they did in 1990, while their value-added contribution has doubled since 1990. When examining a broader set of companies less influenced by sector-specific variations, the ten largest companies show a stable or growing

contribution to the economy, although large fluctuations are evident.

The structure of this paper is as follows. In Part 2, we provide an overview of the background and theoretical framework that forms the foundation of this thesis. In Part 3, we present two important factors that determine how effectively the stock market reflects the broader economy, examining why firms choose to go public and how the value of the market aligns with the economic impact. In Part 4, we describe the methodology used to calculate the value added and adjust for foreign employment. In Part 5, we analyze the aggregated contribution of listed firms to employment and GDP. In Part 6, we discuss the factors driving the observed increase in the contribution of listed firms to employment and GDP, breaking down growth at the sectoral level to identify key drivers and trends. In Part 7, we examine how well the market capitalization of a firm reflects its current contributions to employment and GDP. In Part 8, we investigate the historical development of the largest firms by market capitalization, focusing on their contributions to the economy over time. Finally, in Part 9, we present the conclusion.

2 Background

In this section, we present previous research on the relationship between stock markets and economic contribution. We also highlight how our analysis provides new insight into the field by examining trends in the Nordic stock market. We focus on the evolving roles of market capitalization, employment, and value added.

This article examines how the stock market reflects economic conditions, focusing on exchange-listed firms in Nordic economies. Previous research shows mixed results on the connection between stock markets and economic performance. Ritter (2012) found a negative relationship between stock market returns and economic growth in 19 countries, suggesting that faster growing economies tend to have weaker stock market performance. In contrast, Arestis et al. (2001) argue that stock markets contribute to economic growth, although their role is less significant than that of banks and depends on institutional and structural factors. Fischer and Merton (1984) conclude that the liquidity of the stock market is a predictor of GDP growth, while Harvey (1989) suggests that the data of the bond market have been a more reliable predictor of economic growth over time. Our findings indicate that the stock market plays an increasingly important role in the economy, suggesting that it may have become a more reliable proxy for economic activity since 1990.

More recent studies have explored how the composition of the stock market is related to economic growth. Fogel et al. (2008) showed that few changes in the way companies dominate by market

capitalization are related to slower economic growth, possibly due to reduced competition and innovation. Similarly, Bae et al. (2021) expanded on this by showing that higher market concentration, where a few firms dominate total market capitalization, is linked to slower growth rates. These findings suggest that structural changes in market composition can have significant implications for long-term growth. We observe that the share of total market capitalization represented by the top ten firms is lower now than it was in 1990.

Our analysis adds to the research on how market capitalization relates to economic measures. Belo et al. (2022) demonstrated that labor costs now represent only 14% to 21% of the market value of a firm, reflecting the growing importance of intangible assets. Schlingemann and Stulz (2022) showed that the ability of employment and value added to explain market capitalization has declined, especially in the United States since the 1970s. They attribute this trend to structural changes, such as the decline of manufacturing, increased production abroad, and the rise of the service economy, where firms are less likely to be publicly listed. These factors have reduced the importance of economic metrics such as employment and value added, as market valuations are increasingly shaped by intangible assets and forward-looking growth indicators. Our findings for the Nordics align with these trends, showing that employment and value added now explain a smaller portion of market capitalization compared to previous years.

3 Market value and its reflection of economic contribution

This section examines two dynamics that influence how well the stock market represents the broader economy. First, we explore why companies decide to go public, introducing a selection bias that affects the types of companies in the stock market. Understanding why publicly listed companies can differ from other businesses provides insights into their distinct roles in the economy. These differences often influence their size, reach, and impact on employment, value creation, and economic trends. Second, we investigate how market capitalization relates to economic contribution, highlighting the contrast between investor expectations and value added.

3.1 The decision to go public

Publicly listed companies make up only a small fraction of companies, yet they play an important role in the economy. The Nordics had around 2,937,000 private companies in 2022 compared to only 1,546 listed companies in 2024, highlighting the large gap between public and private entities (SCB, 2023; SSB, 2023; Statistics Denmark, 2023; Statistics Finland, 2023). This distinction exists

because companies weigh the costs and benefits of going public. Public markets provide benefits such as access to capital and increased liquidity, but also entail costs such as regulatory compliance and disclosure requirements. Consequently, the selection of listed companies is influenced by factors such as company size, financing needs, industry, and agency costs. While benefits and costs evolve, so does the selection of listed companies, with larger companies more likely to remain listed.

Companies choose to go public when their characteristics align well with the benefits of public markets. Pagano et al. (1998) argues the main benefits of going public are greater ability to raise funds, ability to use stock as a merger currency, liquidity benefits for shareholders, and information about the company generated by public markets. However, going public comes with costs, including potential underpricing due to information asymmetry, high administrative fees (particularly for smaller companies), and the need to disclose sensitive information, which can damage the competitive advantage (Pagano et al., 1998). Private companies often stay private due to limited perceived benefits in going public, resulting in a clear distinction between private and listed companies.

Stulz (2020) explains how the chances of companies going public change over time based on the shifting advantages and disadvantages of being listed. When listing benefits decline while costs remain constant, fewer companies go public, widening the gap between listed and unlisted companies. Furthermore, Doidge et al. (2017) finds that smaller companies often find these costs too high and choose to stay private, whereas larger companies are more likely to go public. Thus, when the benefits of being listed decrease, the companies that remain listed tend to be larger compared to other companies in the economy. Larger companies generally have a greater economic impact, so even if fewer companies are listed, these larger companies still contribute significantly to the economy (Schlingemann & Stulz, 2022). Therefore, a decrease in the number of listings does not necessarily mean that listed companies are less important to the economy than private companies.

To illustrate, data from SSB (2024) show that Norway had 630,000 active companies in 2022, but only 33% had registered employees. This suggests that many businesses are sole proprietorships or operate without registered employees. Our data, covering 87% of the listed companies in 2022, show that the listed companies in Norway employed 371,000 people, accounting for 12.5% of the national workforce. Notably, these companies made up just 0.05% of all businesses in Norway. This highlights the large differences in size and employment patterns between listed and private companies.

Access to equity markets is especially valuable for companies with large upcoming investment needs.This allows companies to raise public funds rather than taking on more debt. Public listing is particularly attractive for companies with high capital expenditures (CAPEX), substantial investment opportunities, significant leverage, and companies in the growth phase (Pagano et al., 1998). Consequently, companies are more common to list on the stock exchange at this stage, drawn by the funding opportunities offered by public markets.

However, equity investors expect returns on their investments. This puts pressure on listed companies to generate profits and provide value to their shareholders (Shleifer & Vishny, 1997). Investors are generally more willing to finance tangible assets than intangible assets due to concerns about property rights (Sun & Xiaolan, 2019). This is especially relevant for companies in manufacturing and production, where funding is important to scale operations. Without a patent to secure a protected market position, intangibles are perceived as higher risk, lacking the inherent security and measurable value associated with tangible assets (Haskel & Westlake, 2017). Consequently, companies with tangible assets are more likely to be listed, as investors tend to prefer financing either tangible assets or intangible assets backed by patents, rather than intangibles still in development.

In addition, companies in the service sector are less likely to go public. Service companies often heavily rely on human capital, such as expertise and knowledge, which is difficult to quantify and secure through patents (Schlingemann & Stulz, 2022). Human capital is the primary resource in industries like law and consulting, which can easily move to other companies, making it uncommon for such companies to go public. In addition, many service-based businesses do not grow or scale in a way that would justify a public listing. Lastly, the lack of tangible or legally protected assets makes it harder for service companies to attract investors, resulting in fewer service-oriented companies on the stock market.

Another factor to consider is the variation in agency costs which are incurred due to the separation of ownership and management. Aligning the interests of key personnel with those of the owners can be challenging and costly, as these employees may seek to prioritize their own career goals over shareholder returns. Agency costs differ significantly between industries. In certain sectors, agency costs tend to be higher, making public listing a less appealing option for companies (Fama & Jensen, 1983). Consequently, industry composition affects the economic contribution of publicly listed companies.

3.2 How market value relates to economic impact

The relationship between market capitalization and the economic contribution of a company is complex and often misunderstood. Market value is an indicator of a company's worth by investors, but does not directly reflect a company's contribution to employment or GDP. Using the Gordon Growth model, it is evident that cash flows and value added have an impact on market value. However, numerous other factors also influence market value, including future prospects, productivity, required returns, and growth potential.

Value added represents the contribution of a company to GDP and is calculated by subtracting the cost of intermediate inputs from the gross output (Co-operation & Development, 2001). In this context, value added serves as a measure of the direct economic contribution of companies, encompassing wages, profits, and taxes. In national accounting, GDP can be determined using the production approach, which calculates the total value of goods and services produced in the economy (Co-operation & Development, 2001). Thus, understanding the value added at the firm level helps to understand its impact on GDP and overall economic growth.

$$Value\ added\ for\ a\ firm = Y_t - l(t) * q(l)$$

Where Y_t represents the output produced, $l(t)$ denotes intermediate goods, and $q(t)$ is the price per unit of these goods.

Market capitalization is determined by the present value of all expected future cash flows a company will generate (Damodaran, 2012). Unlike value added, which quantifies the economic contribution of a company, market capitalization is influenced by intangible factors such as investor sentiment, growth potential, and risk assessments (Damodaran, 2012).

The relationship between market capitalization (MV_t) and the contribution of a company to the economy can be expressed using the Gordon growth model (Schlingemann & Stulz, 2022). The model, widely used in finance to estimate the value of a company, is given by $MV_t = \frac{Div_t}{r-g}$, where Div_t is the expected dividend in period t, r is the required rate of return and g is the dividend growth rate (Gordon, 1962). This model links a company's cash flows, which contribute to market capitalization, with its capacity to produce economic returns, such as dividends. Assume dividends are given by $Div_t = Value\ added * f * d$, where f is the fraction of cash flow from value added to

shareholders and d is the dividend payout ratio. From this we derive the value of a company:

$$MV_t = \frac{(Y_t - l(t) \cdot q(t)) \cdot f \cdot d}{r - g}$$

Applying this model and keeping other factors constant, a companies market capitalization can increase when shareholders receive higher dividends due to an increase in value added. This can occur when a company expands its operations, reduces input costs without cutting labor demand, or achieves technological progress that increases productivity without substituting labor (Schlingemann & Stulz, 2022). This suggests that a company's relative market capitalization is directly connected to its relative value added assuming that other factors remain constant. If employment remains a fixed proportion of value added, the relative market capitalization will match relative employment contributions. Moreover, if growth is driven by reinvesting profits to enhance productivity or expand operations, it directly contributes to the value added by increasing output and economic activity (Porter & Heppelmann, 2014). Through investments and payout processes, value added influences future cash flows and market capitalization of companies.

The relationship between market value and economic contribution is complex and is not always directly aligned. For example, even with constant value added, the market capitalization of a company can vary depending on changes in the discount rate, expected growth, or the leverage ratio. For example, if the equity share of value added doubles while other factors remain constant, the companies' valuation doubles. Furthermore, a company can increase its market value through greater efficiency, such as reducing production costs, which can enhance future free cash flows but simultaneously decrease its broader economic contribution by reducing employment or spending on inputs (Porter & Heppelmann, 2014). In addition, two companies with identical economic contributions today can have very different valuations due to investor expectations for future cash flows (Damodaran, 2012). Market capitalization is a forward-looking metric and does not necessarily align with current contributions. Lastly, since much of the market capitalization of a company is based on future potential rather than current cash flows, the loss of current cash flows would have a limited impact on the valuation but could significantly reduce the company's value added in the same year (Co-operation & Development, 2001).

The difference between market value and economic contribution highlights the importance of thorough analysis when assessing a company's impact on the economy.

4 Approach to Nordic Employment and Value Creation

This section presents the methodology and data used to estimate the economic contributions of listed companies. The analysis focuses on direct contributions to the economy, such as employment and value added, while excluding indirect effects, such as impact on suppliers. Our methodology is consistent with US studies (Schlingemann & Stulz, 2022), allowing consistent cross-regional comparisons. We also present the results for two groups: industrial firms, which exclude the financial sector, and public firms, which include all companies. To account for foreign affiliates of listed companies, we develop several methods to determine the domestic contribution of listed companies of listed Nordic companies. The adjustments applied throughout the analysis are based on three distinct methods for correcting for foreign employees, aiming to provide a balanced view of the economic contributions of listed companies in the region.

4.1 Main methodology of value added

Compustat Global is our main source of employment data and other company-specific metrics. We start our analysis in 1990, as the early years (starting in 1988) had few companies and incomplete data. Since 1990, our employment data cover at least 83% of the market capitalization of listed Nordic firms, rising to 99% in 2023. This is after making some minor adjustments to the data. When employment data are missing for a specific year but available in the years before and after, we estimate the missing value by averaging those two years. Such gaps often arise due to large transactions, such as mergers. For missing values at the beginning or end of a company's data series, we fill the gaps using the nearest available value. Lastly, since the data includes all types of securities, we only include equities listed on the Nordic stock exchanges [3].

Unlike employment figures, companies do not directly report value added. As described in Part 3.2, the value added of a company is typically calculated as revenue minus the cost of the goods used in production. A country's GDP is calculated as the total value added by all companies in the economy. By calculating the value added for listed companies, we determine the total listed contribution to GDP. Using Compustat data, we calculate each company's annual value added by summing operating income before depreciation (OIBDP) and labor costs (XLR), a common approach in the literature (Donangelo et al., 2019). However, since only 57% of the total observations disclose labor costs, we have to estimate labor costs at the firm level where necessary.

[3]Exchange codes included are Nasdaq OMX Helsinki in Finland (167), Oslo Børs ASA in Norway (228), the Stockholm Stock Exchange in Sweden (256), the Spotlight Stock Market in Sweden (344), and OMX Nordic Exchange Copenhagen in Denmark (144)

Our main method for estimating the value added is a modified version of the Donangelo et al. (2019) approach [4], which excludes winsorization and calculates missing labor costs using the median rather than the mean (Schlingemann & Stulz, 2022). For missing labor cost data (XLR), we estimate values by multiplying the number of employees in the company by the industry's median cost per employee from available data. Originally, Schlingemann and Stulz (2022) classified companies using the Fama-French 17 industry classification to find the mean, switching to Fama-French 10 or the two-digit SIC code if an industry had fewer than 20 observations in a given year. In our analysis, we adopt the same approach, but if fewer than 20 observations remain, we further classify using the one-digit SIC code. This approach is essential because of the limited size of our data and the number of unclassifiable observations. In part 4.2, we explore alternative methods to calculate the value added and apply them to our data.

4.2 Alternative approaches to value added estimation

In line with Schlingemann and Stulz (2022), we apply alternative methods from the literature to estimate the value added. In total, we estimate six main methods in which we vary based on different factors such as winsorization, industry classification, and central measures. The correlations between these different measures are high, with a minimum correlation of 87%. However, methodological choices when calculating value added can have a large impact on the results for the largest companies, which will be addressed below.

Our main measure, Method 0 above, follows the same approach as Schlingemann and Stulz (2022) to estimate the value added, with our own modifications. This method was originally developed by Donangelo et al. (2019). Their approach involves adding inventory changes to operating income before depreciation and calculating the average labor cost based on the Fama-French 17 industry classification (FF17), using the two-digit SIC industry average as a fallback when necessary (Method 1). Similarly, Bennett et al. (2020) calculate the average labor cost per employee for each industry and multiply it by the number of employees, using the Fama-French 12 (FF12) industry classification (Method 2). Furthermore, Hartman-Glaser et al. (2019) exclude inventory changes, categorize firms into 20 size groups based on total assets within each industry, calculate average labor costs, and apply winsorization to control for outliers (Method 3). However, like Schlingemann and Stulz (2022), we developed a Method 4, which modifies the Hartman-Glaser et al. (2019) approach by separating firms into three portfolio sizes within industry classifications, avoiding winsorization and utilizing medians to mitigate the influence of outliers. Lastly, we introduce a

[4] Value added = XLR + OIBDP + INVCH (inventory change)

fifth alternative (Method 5), in which we modified Hartman-Glaser et al. (2019) by grouping firms based on market capitalization rather than total assets. This method uses market capitalization as a sorting criterion, reflecting the market's assessment of a company's value and growth potential, offering a dynamic alternative to the static measure of total assets.

Our main method does not use winsorization, as we aim to not underestimate companies' contributions to the economy. However, alternative versions utilize 1% and 5% winsorization to replicate the approach used in previous studies. Similarly, the three cited studies exclude financial companies from their estimates, while we have calculated value added for both public firms and industrial firms. Results including financial companies should be interpreted with caution, as value added estimates are generally more reliable and well-established within the industrial sectors.

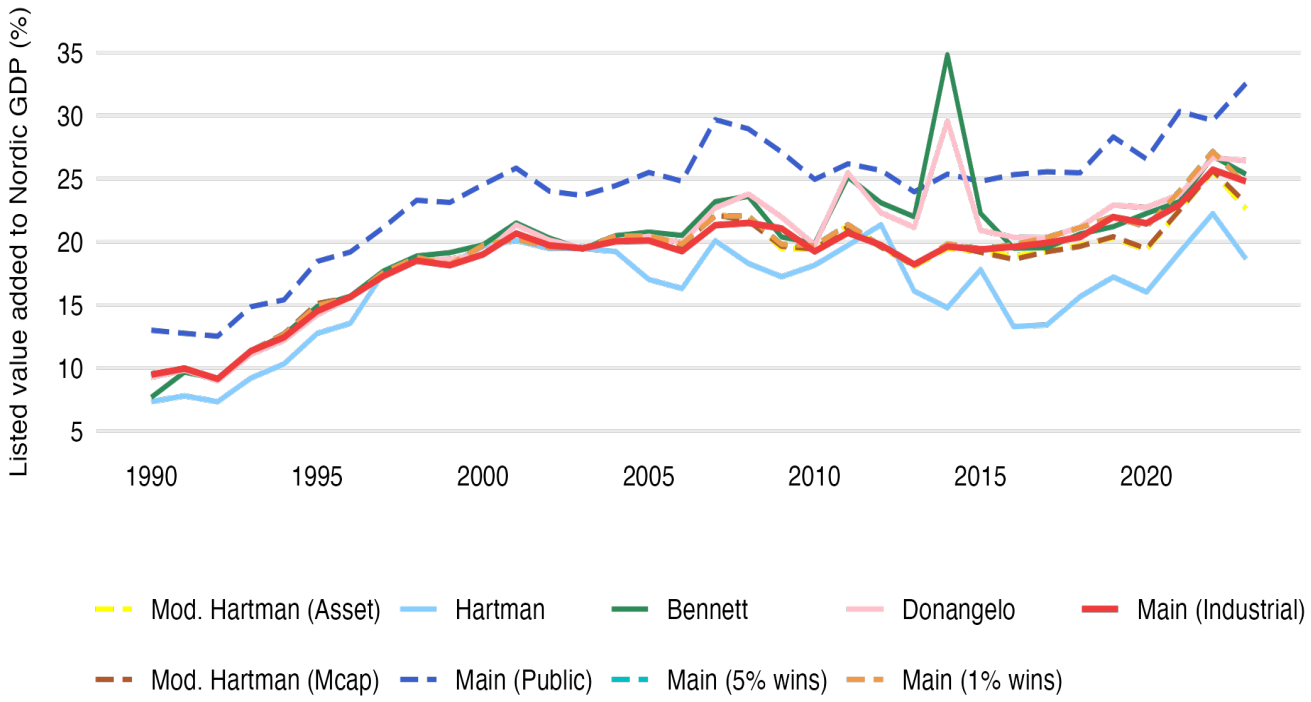

Figure 4.1: Listed value added as a share of Nordic GDP with different methods (1990–2023). The graph shows the value added by listed companies as a percentage of Nordic GDP, calculated using various methods. The overall trend is similar for all methods.

Figure 4.1 presents the evolution of nine versions of value added as a percentage of Nordic GDP from 1990 to 2023. The figure includes our main measure without winsorization (red), the main method with winsorization 1% and 5%, and all alternative measures based on the methods of Donangelo et al. (2019), Bennett et al. (2020), and Hartman-Glaser et al. (2019). We have also included our main method that includes financial companies (public firms); however, this method has higher values because more companies are included. Despite some differences in methodology, we see from Figure 4.1, all approaches produce results closely aligned with our main conclusions

and estimate.

4.3 The role of foreign affiliates

A notable limitation of Compustat Global is that the data for listed companies include global figures. For multinational companies with foreign affiliates, this means that the total employment includes employees outside the Nordics. Since employment is used to estimate value added, and operating income before depreciation (OIBDP) includes contributions from foreign affiliates, the value-added figures represent global rather than Nordic-specific contributions. Therefore, without adjusting for the impact of foreign affiliates, our results likely overestimate the direct contribution of listed firms to the Nordic economy. If foreign operations have expanded over time, this overestimation will be greater in the later years of the analysis.

Schlingemann and Stulz (2022) develop three different approaches to estimate foreign activities and use this to estimate domestic contribution of listed firms to U.S. economy[5]. The midpoint, termed the MNE-adjusted contribution, is used throughout the analysis to adjust for foreign activities in multinational enterprises. This method leverages Compustat data to identify firms with foreign revenues and adjusts these companies based on the proportion of employees in foreign affiliates (both listed and private) to the total workforce of multinational enterprises (MNEs), both reported by the Bureau of Economic Analysis (BEA). Schlingemann and Stulz (2022) find that the contribution of the listed firm to domestic employment and GDP is lower and decreases more significantly over time when foreign activities are excluded. Notably, foreign activities surged sharply in the 2000s, and accounting for them reveals a decline in the role of listed firms in the US economy during this period, a trend not evident in unadjusted figures.

4.3.1 Data collection

Due to limitations in the Compustat Global data and the absence of comparable sources such as those provided by the BEA, we cannot distinguish between domestic and foreign activities. This restricts our ability to perform analyses similar to those of Schlingemann and Stulz (2022). However, we have developed three approaches to account for foreign affiliates, which include manually collecting information to distinguish domestic and foreign activities. We reviewed annual reports and found that many companies provide detailed employee data by segments

[5] Upper bound: $\frac{\text{Listed employment}}{\text{US non-farm employment} + \text{BEA foreign affiliates employment}}$

Midpoint: $\frac{\text{Employment listed firms} \cdot \left(1 - \frac{\text{BEA foreign affiliates employment}}{\text{BEA total MNE employment}}\right)}{\text{US non-farm employment}}$

Lower bound: $\frac{\text{Total employment listed firms} - \text{BEA foreign affiliates employment}}{\text{US non-farm employment}}$

and geographic markets. If not, we analyzed regional revenue, checked company websites for international activities, or concluded that the data was inaccessible. Due to the extensive scope of this effort, we obtained data for each company covering between 10 and 15 years and applied linear interpolation between the years to fill in gaps. We calculated the Nordic percentage shares and applied them to employees, revenues, and costs. Consequently, the same percentage is used to estimate both domestic employment and value added.

Our estimates offer an approximation for distinguishing domestic contributions, but are subject to limitations. Firstly, our data are incomplete for several years, and we assume linear interpolation to fill in gaps, which may overlook effects such as acquisitions. Furthermore, the data used in this analysis were sourced directly from the companies' own channels. This could introduce inconsistencies, particularly since different companies can include varied elements, such as contractors or part-time workers, in their reports. In addition, the calculations for employment and value added are based on the same domestic share, which may not be representative for both measures. Despite these limitations, the findings provide an estimate of the domestic listed contribution. It is also important to note that foreign multinational companies, such as Microsoft, employ people in the Nordic region, extending the influence of listed companies beyond the domestic figures presented here. As a result, these figures represent a lower bound of the total impact of listed companies on the Nordic economy.

In the first method, we collected data on foreign affiliates for the 30 companies with the most employees from 1990 to 2023. This approach adjusts the most influential observations while addressing only a small number of firms. The 30 largest companies account for 47 million employees during the entire period, representing 51% of the total of 92 million employees. Figure 4.2 presents the development in the average Nordic share for the top 30 companies by employment. The average Nordic share has decreased from 48% in 1990 to 28% in 2023. This method applies only to a subset of companies, excluding many smaller companies that may also have significant portions of their workforce outside of the Nordics. If such firms are numerous, the adjustment overlooks a substantial number of employees, potentially distorting the results. Consequently, while this approach captures the main contributors to overestimation, it still represents an upper bound of contribution to the economy.

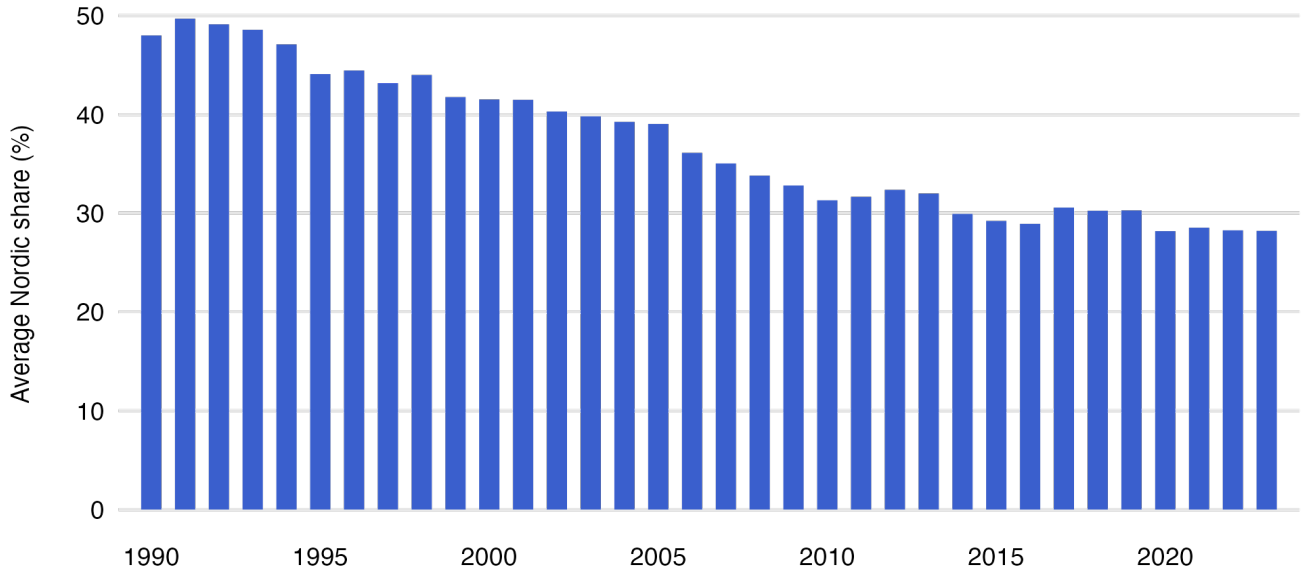

Figure 4.2: Average share of Nordic contribution for the 30 largest companies by employment (1990-2023). The figure illustrates a downward trend in the employment share of these companies across the Nordic region, starting at 48% in 1990 and declining to 28% by 2023.

In the second method, we address the limitations of the first approach by adjusting the entire data. We categorized companies into eight sectors (described in Part 6.1) and used random sampling to collect data on the share of employees outside the Nordics for eight companies per sector. Based on this, we calculated the average share of Nordic employment for each sector annually and applied this to the companies within the same sector. This approach includes smaller companies, which could have substantial workforces outside the Nordics, reducing the risk of overestimating the contribution of listed companies. The method also accounts for sectoral differences in the share of foreign employees. Figure 4.3 presents a general declining trend i Nordic share in the sectors. Finance, insurance & real estate, and mining & construction are the sectors with the highest employment in the Nordics, while manufacturing and wholesale, retail, transportation & electric have the lowest share. However, averaging foreign employment shares from a sample of companies per sector can lead to inaccuracies if the samples do not represent broader sector trends. The method fails to capture size variations within sectors, potentially underestimating the influence of the largest companies.

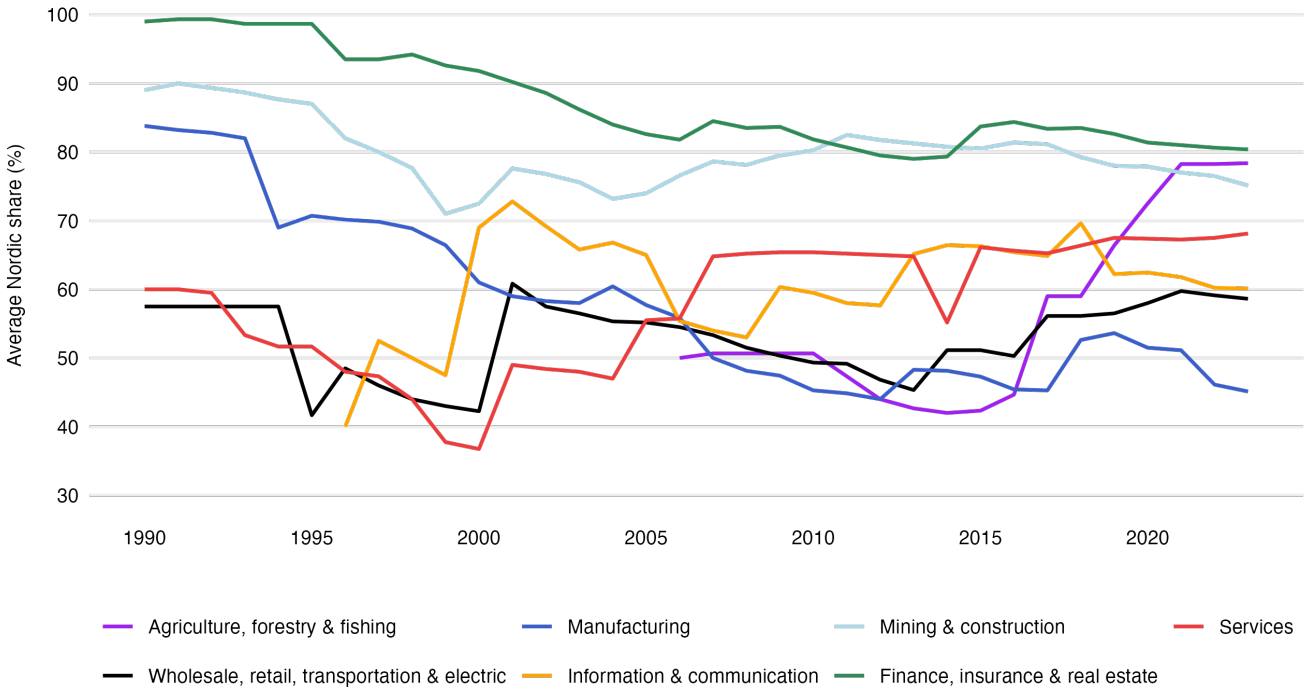

Figure 4.3: Average Nordic share by sector (1990-2023). Finance, insurance & real estate have the highest Nordic share (100-80%), while wholesale, retail, transportation & electric have one of the lowest (40-60%). The general trend across sectors has been gradually declining.

In the third method, we address the limitations of the second approach by adjusting based on company size. We divide companies into five groups by market capitalization and annually sample data on the share of employees outside the Nordics for each group. A total of 80 unique companies are included, with at least three observations per year. Based on this, we calculate the average share of Nordic employment for each group annually, which is then applied to companies in the same group. This approach takes into account that larger companies are likely to employ more foreign workers compared to smaller ones. Figure 4.4 presents a relatively stable Nordic share in the five market capitalization groups during the period. However, there is a clear trend that indicates that the Nordic share decreases as the company size increases. Presenting the data over multiple years reveals trends in internationalization in different sizes over different time periods. However, this approach overlooks sectoral differences in foreign employment and risks selection bias, potentially misrepresenting foreign employment patterns if the chosen companies are outliers.

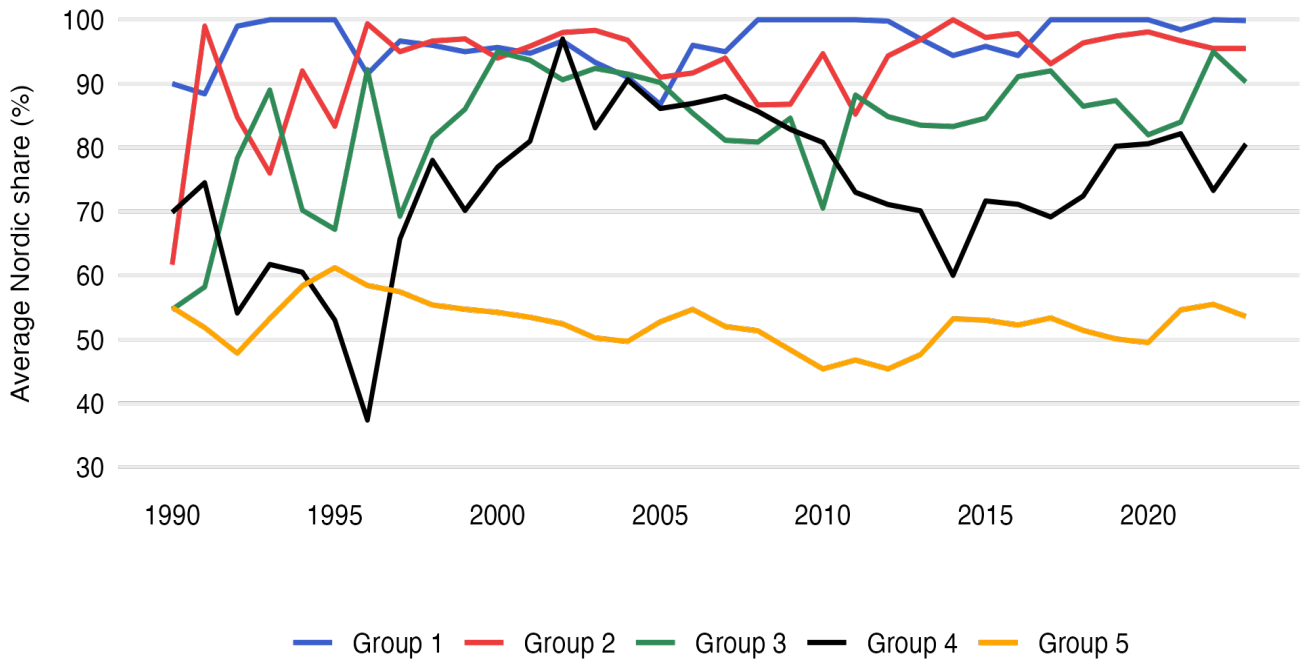

Figure 4.4: Average Nordic share by market capitalization group (1990-2023). The largest companies (Group 5) have the smallest Nordic share (50%), while the smallest companies (Group 1) hold the largest share (95%). All groups show relatively stable trends, except for Group 4.

Lastly, we have developed a combined method that accounts for the most influential companies while adjusting the remaining companies based on their sector and size. First, we used the first method, where we created an accurate estimate of the share of Nordic employees for the top 30 companies by employment. We then excluded these top companies when calculating the average Nordic employment share for the remaining firms, using a weighted average that equally considers sector and market capitalization. This exclusion ensures that the results are not skewed by large companies, providing a more representative estimate for smaller companies. Each year, we divide the eight sectors into five groups based on market capitalization and apply the weighted average. Using both sector and market capitalization ensures that adjustments reflect variations in internationalization patterns across sectors and company sizes. The assumption is that, on average, comparable publicly listed firms share a similar ratio of employment by foreign affiliates. However, for smaller firms, relying on averages can overlook important differences between specific companies. Additionally, combining sector and market capitalization categories can create redundancies in densely populated groups, limiting the method's ability to capture meaningful differences.

4.3.2 Applying the different methods

Figure 4.5 presents the foreign share of Nordic employment and GDP since 1990, using the four methods described above. We observe that the Nordic share of employment is closely aligned for the Top 30 employment, Sector, and Market capitalization estimates, while the Combined estimate is higher. The Top 30 estimate, considered reliable for the largest companies, establishes a lower bound for the foreign share. This suggests that the Sector and Market Capitalization estimates may underestimate the extent of foreign affiliates, likely due to incomplete accounting of the largest companies' foreign contributions. However, the Combined estimate includes the Top 30 companies, with the difference between the two reflecting the foreign employment contributions of the remaining companies. From the Combined estimate, the share of foreign employees in listed companies increased 45% during the period, from 38% in 1990 to 55% in 2023. The value added share from the Sector and Market Capitalization estimates does not show a similar underestimation of foreign contributions. The foreign contribution to Nordic GDP increased from 27% in 1990 to 45% in 2023, a total of 67%. In total, the contribution of foreign affiliates has increased over time.

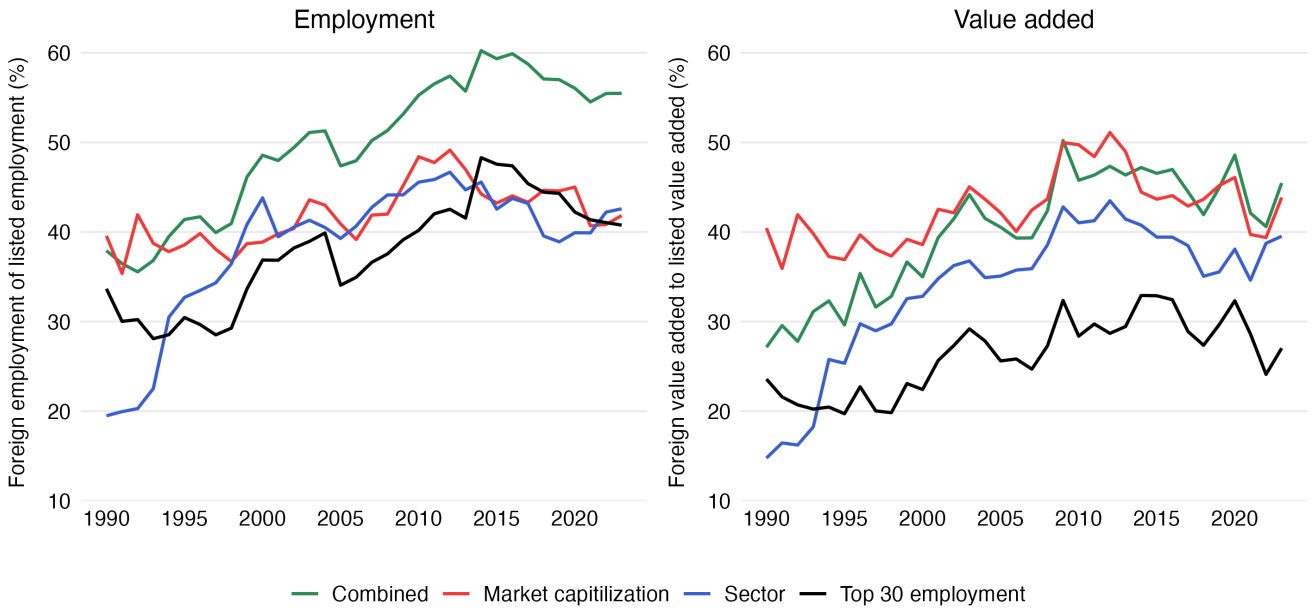

Figure 4.5: Foreign affiliate share of listed employment and value added (1990–2023). The left panel shows foreign employment share, and the right panel shows foreign value added share for listed companies. Four methods are used: Combined, Market capitalization, Sector, and Top 30 employment.

We have used the four methods above to adjust the employment of listed companies to find domestic employment. Each method presents the contribution of the listed companies to Nordic employment in three forms: unadjusted [6], upper bound [7], and lower bound [8]. The upper bound

[6] Unadjusted $= \frac{\text{Global listed employment}}{\text{Nordic employment}}$

[7] Upper bound $= \frac{\text{Global listed employment}}{\text{Nordic employment} + \text{Listed foreign employment}}$

[8] Lower bound $= \frac{\text{Global listed employment} - \text{Listed foreign employment}}{\text{Nordic employment}}$

is the total number of employees in listed companies as a percentage of the global labor force, including both Nordic employees and those working for foreign affiliates. The lower bound is determined by subtracting the yearly foreign employees from the global listed employment and then dividing by Nordic employment. This establishes an upper and lower bound for the impact of listed companies on Nordic employment, which can be compared to the unadjusted bound, which includes foreign employment. In the following parts, the adjusted industrial and public figures refer to the lower bound of the Combined estimate. Figure 4.6 present the domestic contribution of listed companies to Nordic employment using all four methods. Value added adjustments are shown in Figure A.2 in the appendix, where similar adjustments have been applied to revenue and employment figures. Note that in the following parts, the adjusted industrial and public numbers refer to the lower bound of the Combined estimate.

As illustrated in Figure 4.6, the upper bound for the contribution of listed companies to domestic employment is closely aligned with the unadjusted figures, although it is slightly lower each year. The upper bound remains consistent across all methods, while the lower bound shows greater variability. As shown in Figure 4.5, the combined estimate falls below the others. In the Combined estimate, the gap between the unadjusted and upper bounds gradually widens over time, growing from 0.4% in 1990 to 3.1% in 2023. The largest divergence occurs in 2018, reaching 3.4%. In contrast, the lower bound is significantly lower than the other estimates, but follows a similar trend: a rise until 2000, a slight decline until 2011, and a gradual increase thereafter. The figure shows a growing gap between the unadjusted values and the lower bound throughout the period, particularly noticeable during the 2000s. The Combined estimates show that the domestic contribution of listed companies rose from 7% in 1990 to 11% in 2023, an increase of 57%. This growth is less than the unadjusted estimate, which increases by 127% over the same period. As shown in Figure A.2 in the appendix, including foreign affiliates consistently overestimates the contribution of listed companies to Nordic GDP. The lower bound indicates an increase of 100%, while the unadjusted estimate reveals a larger increase of 154%. Overall, the analysis reveals that publicly listed companies have increased their economic contribution since 1990. However, excluding foreign employees significantly lowers this contribution, particularly after 2000.

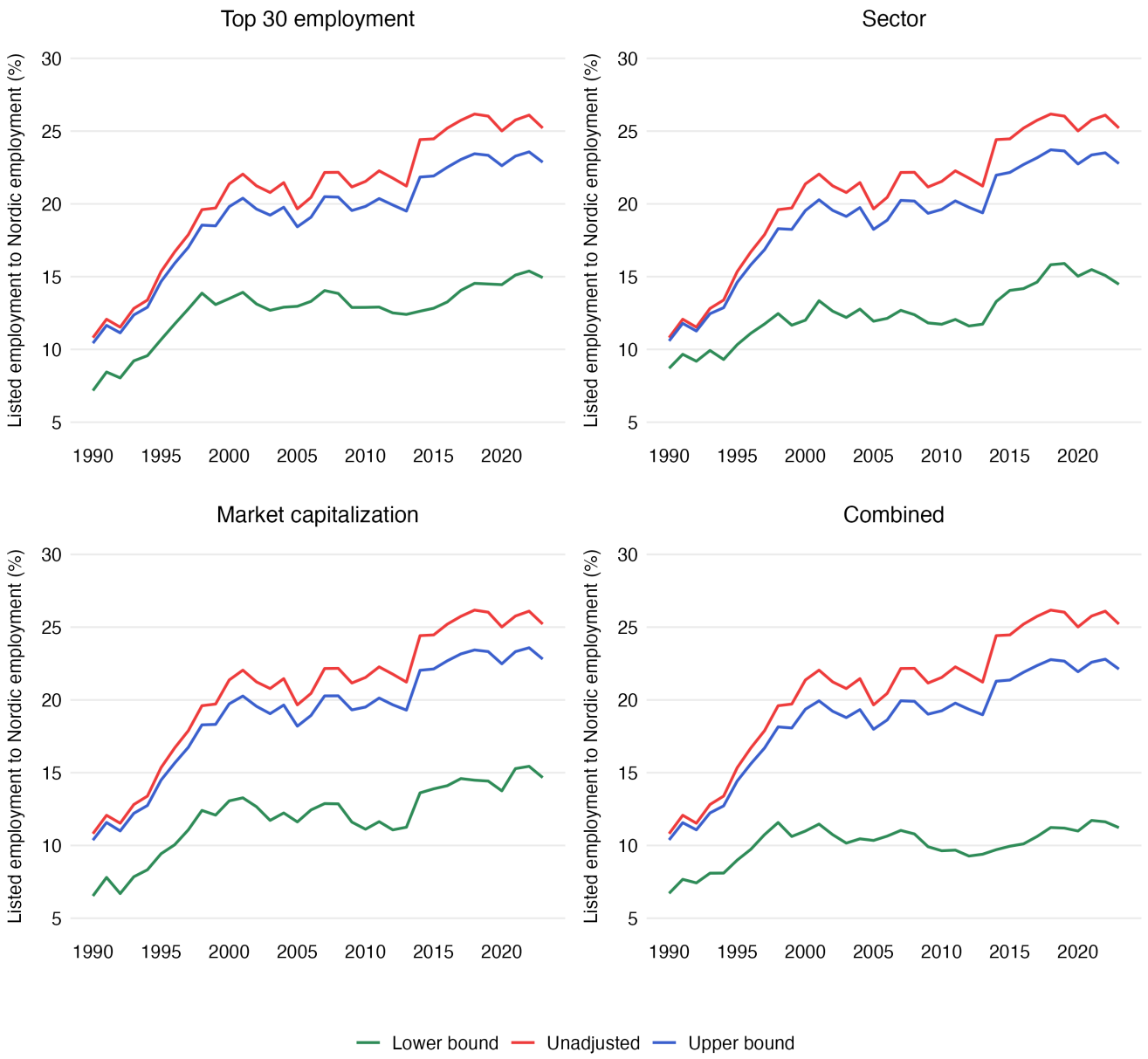

Figure 4.6: Four estimates of domestic contribution of listed employment to Nordic employment (1990–2023). The share of listed employment to Nordic employment, estimated with four methods: Top 30 Employment, Sector, Market Capitalization, and Combined. Each panel displays a lower bound (green), unadjusted (red), and upper bound (blue) of contributions to the Nordic economy.

5 The economic role of listed firms

This section examines the aggregated contribution of listed firms to employment and GDP. The analysis includes both industrial and public companies and highlights trends in global and domestic contributions, accounting for the impact of foreign affiliates. The distinction between industrial and public firms is made to reflect differences in their economic roles and data availability, since industrial firms typically provide more consistent and reliable metrics to assess employment and value added. Furthermore, the findings are compared with those from the United States, providing

insight into how trends in employment and value added differ between regions. In addition, this section examines country-level variations, highlighting the differences in contributions among Sweden, Norway, Denmark, and Finland.

5.1 Contribution of listed companies to employment and value added

5.1.1 Employment

Figure 5.1 shows the evolution of employment by listed companies as a percentage of total employment in the Nordics, covering both public firms and listed industrial firms during the period 1990-2023. The global employment share of listed industrial firms increased from 10% in 1990 to 23% in 2023. Starting from its lowest point in 1990, employment in listed industrial firms increased by 13 percentage points, equivalent to an increase of 130%. The listed employment grew notably during the 1990s, remained steady from 2000 to 2014, and then increased again approaching 2023. Figure 5.1 also shows the domestic contribution of listed companies to Nordic employment. Employment in listed industrial firms has increased from 6% in 1990 to 10% in 1990, an increase of 66%. The adjusted figures show that part of the employment growth among listed companies is driven by their increased hiring outside the Nordic region, with companies hiring more employees abroad in 2023 than in earlier decades.

Our results can be compared with those of the United States, as presented by Schlingemann and Stulz (2022). However, since their data extend back to 1973, it is relevant for us to focus on their figures starting from 1990. Employment by industrial listed companies was approximately 26% of non-farm payrolls in 1990, down from 40% in 1973, before further decreasing to 25% by 2019 (Schlingemann & Stulz, 2022). The share of employment by listed firms decreased sharply from 1973 to 1990, rose again in the 1990s, and then remained relatively stable but slightly declining from 2000. The trend in the Nordics is similar, but while the Nordics have seen a modest increase in the last 10 years, the US has remained steady. When comparing domestic results that account for foreign employees, both regions show a rise during the 1990s. However, the patterns diverge afterward: in the US, the adjusted share drops sharply, while in the Nordics, it remains relatively stable with a slight upward trend toward the end of the period.

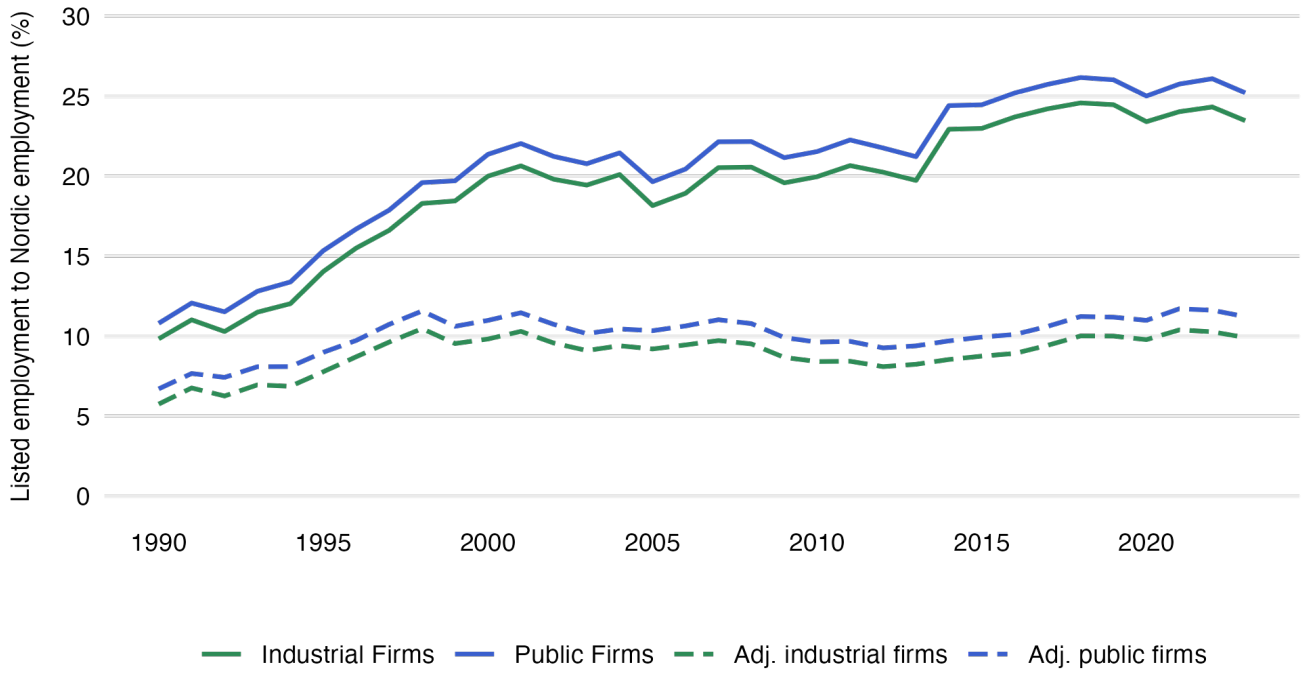

Figure 5.1: Listed employment as a share of Nordic employment (1990-2023). The graph shows the employment trends for listed industrial and public firms as a percentage of total Nordic employment. The solid lines represent the share of listed employment for industrial (green) and public (blue) firms, while the dashed lines shows the adjusted share of listed employment.

5.1.2 Value added

Figure 5.2 shows the development of value added by listed companies as a percentage of total GDP in the Nordics between 1990-2023. The global value added of listed industrial firms increased from 10% in 1990 to 25% in 2023, an increase of 150%. Similarly to employment, the value added by listed companies increased sharply during the 1990s, remained relatively stable until 2017, and then increased again leading up to 2023. Adjusted for foreign activities, as shown in Figure 5.2, the plot reveals a more modest increase. The domestic value added of listed industrial firms increased from 6% in 1990 to 13% in 2023, an increase of 117%. Once again, we observe that part of the growth in value added is driven by international expansion. However, this effect is more pronounced when looking at employment.

In the United States, the global value added by listed companies decreased from 30% in 1973 to 21% in 1990, before slightly increasing to 22% in 2019 (Schlingemann & Stulz, 2022). The share of value added declined sharply in the years leading up to 1990. Since then, it has shown greater fluctuations, particularly in the late 1990s and around the financial crisis, but the overall level in 2019 remains similar to that of 1990. Compared to the Nordics, the results show a similar trend toward employment. In both regions, the value added share increased up to the 2000s, followed

by a period of stability. However, while the Nordics experienced a slight increase after 2017, the United States remained stable (notably, parts of this growth is after the US study ends). When comparing domestic results, both regions show an increase during the 1990s. After this point, the trends differ: in the US, the adjusted share of value added decreases, whereas in the Nordics, it stays mostly steady with a modest increase toward the end of the period.

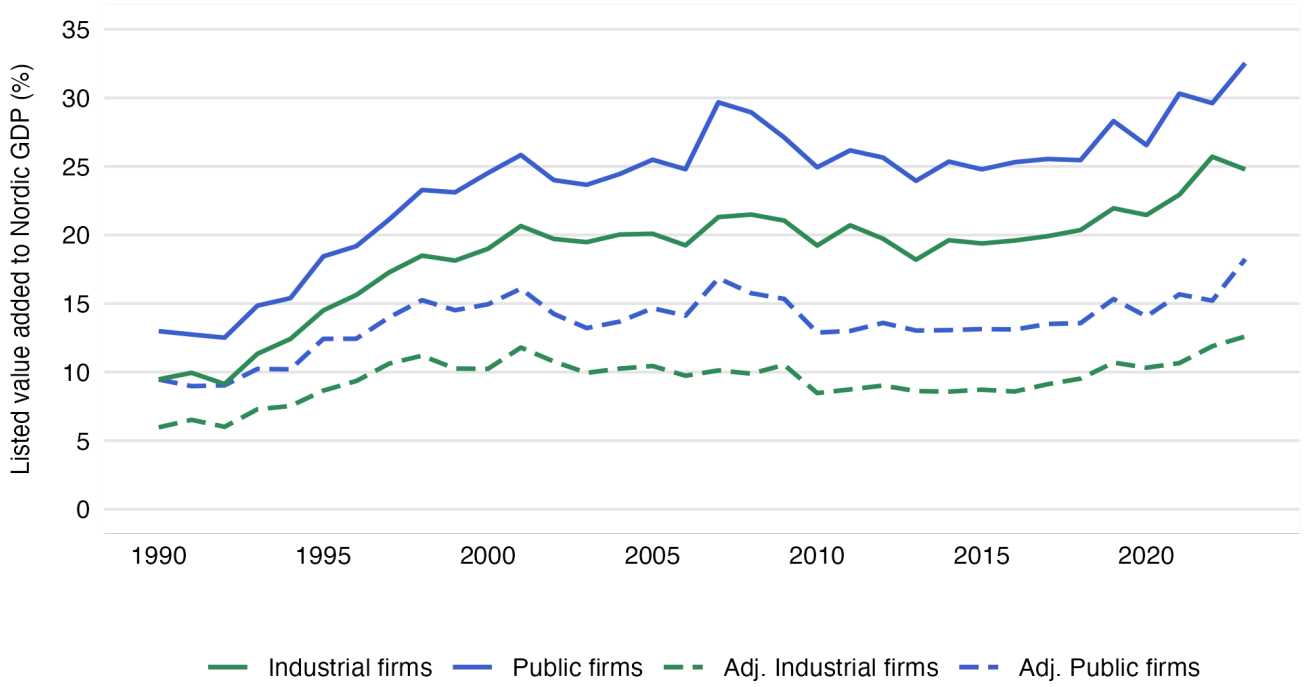

Figure 5.2: Listed value added as a share of Nordic GDP (1990–2023). The figure shows the value added by listed industrial and public firms as a percentage of Nordic GDP. The solid lines shows the value added for industrial (green) and public (blue) firms, while the dashed lines shows the adjusted value added.

In summary, listed companies in the Nordics have increased their contributions to both employment and value added between 1990 and 2023, with similar trends observed for industrial and public companies. Adjusting for foreign employees reveals that part of this growth has been driven by international expansion. Compared to the United States, the global contribution shows a similar trend up to around 2015. Beyond this point, the contribution in the Nordics shows an upward trend, whereas in the United States it remains stable or declines according to the adjusted figures.

5.2 Contribution of listed companies country

Despite the many cultural and economic similarities between the Nordic countries, each nation has distinct economic structures, regulatory frameworks, and industrial strengths that shape the role of listed companies. Since 1990, these countries have experienced distinct economic developments that have impacted the contributions of listed companies in various ways. Based on the trends

described above, this section explores how these contributions differ between Sweden, Norway, Denmark, and Finland.

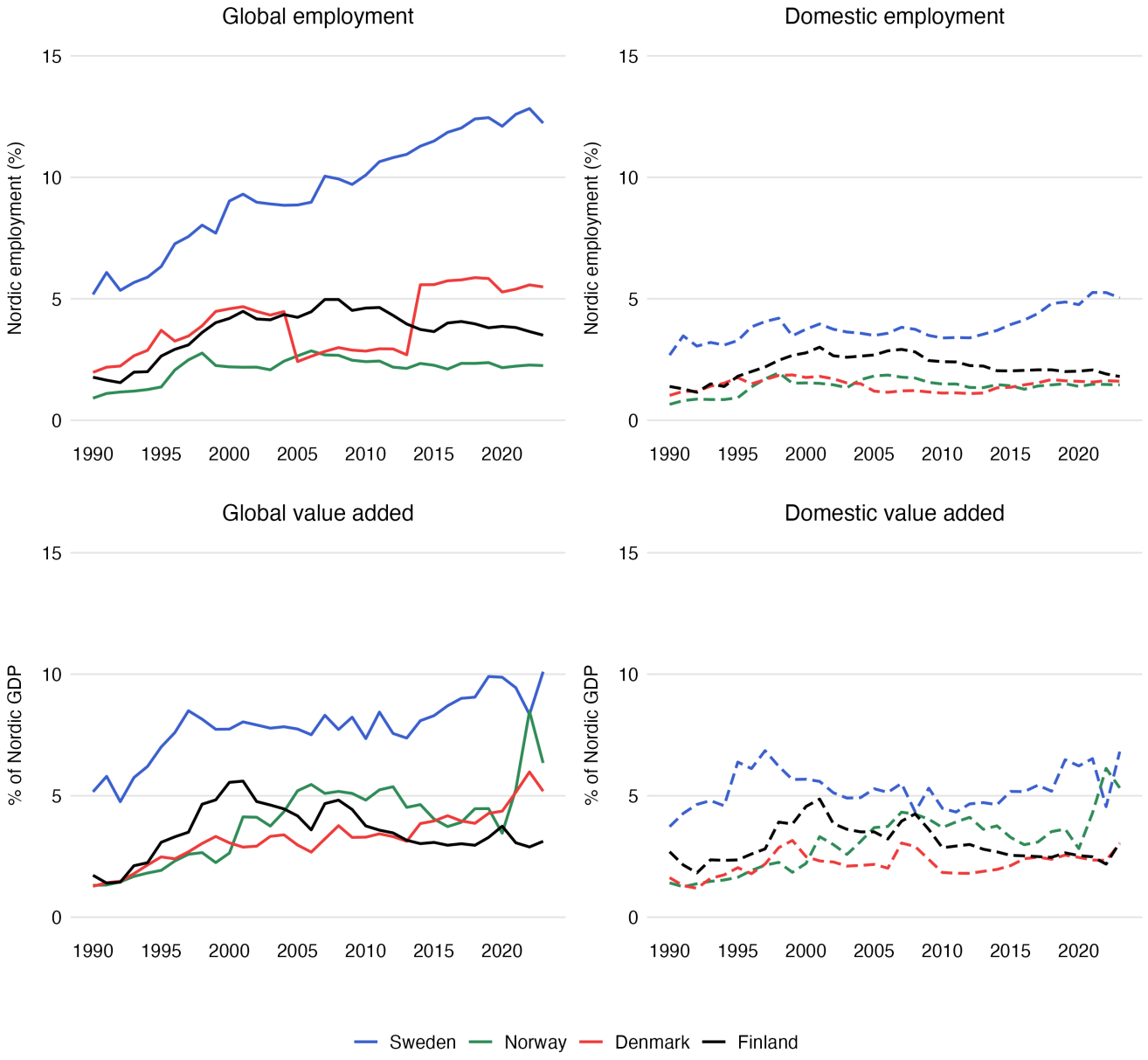

Figure 5.3: Listed contribution to Nordic economy represented by each country (1990–2023). The upper panels shows global and domestic employment for listed companies as a percentage of Nordic employment, while the lower panels shows for value added. Each country is represented by one color.

Figure 5.3 shows the development in the employment contributions of listed companies to the Nordic economy between 1990 and 2023. Sweden stands out as the largest contributor to global employment among the Nordic countries and accounts for more than the other countries combined. Over time, Denmark has been the second largest contributor to listed employment, followed by Finland in third place, with Norway as the smallest contributor. The right panel shows the contribution after adjustment for foreign workers. The domestic employment share decreases for all countries, and Sweden experiences the most significant decline. Furthermore, Finland appears

to contribute more to domestic listed employment than Denmark during the period.

Figure 5.3 also shows the value added contribution of listed companies to the Nordic economy between 1990 and 2023. All countries have increased their global share of value added during the period, but Finland appears to show a declining trend, in contrast to the other countries. Again, Sweden stands out as the largest contributor to global and domestic value added, but not as dominant as for employment. In recent years, the gap between Sweden and the other countries has narrowed as the listed value added share in Denmark and Norway increased sharply, with Sweden and Norway showing equal shares of Nordic GDP in 2022. By 2023, this trend reversed and the gap widened again, with Sweden regaining a higher share. Finland experienced a sharp increase in the late 1990s, peaking around 2000 as the second largest contributor after Sweden. However, it steadily declined toward 2023, becoming the country with the smallest contribution to Nordic GDP. The right panel, showing the domestic listed contribution to value added, reveals a lower value added share in all countries. It also reveals a more side-ways trend throughout the period, with Norway being the exception. When accounting for foreign workers, we find that Sweden still holds the highest share of domestic value added throughout most of the period, except in 2022, when Norway recorded the largest share.

6 What explains the rise in economic contribution?

In part 3.2, the theory presents factors that increase the probability that certain sectors have publicly listed companies compared to others. Building on this, this section investigates the factors that contribute to the increased economic impact of listed companies observed above, with a focus on the role of different sectors in the economy. In the first part, we explore how the relative importance of various sectors has changed over time, examining both absolute and relative employment shares between listed and private firms. In the second part, we perform a shift-share analysis to provide a deeper understanding of these trends. The analysis distinguishes between the effects of sectoral employment changes and shifts in the share of employees working for listed companies.

6.1 The evolving role of employment in different sectors

The approach involved classifying all listed companies into different sectors, followed by determining total employment within these sectors in the Nordics. Compustat Global uses SIC codes for sector classification. We have used the first digit in the SIC code (one-digit SIC code) to

categorize companies into broader sectors [9], such as services and agriculture, forestry & fishing. Reclassifications were made for companies that were incorrectly classified or did not have a SIC code [10]. Nordic employment data across all sectors were obtained from Eurostat (2024), with records available from 1993 onward. Since Eurostat employs a different sector classification system, we developed a custom mapping [11], based on recommendations from Eurostat (2007), to align with the SIC one-digit classification. The most significant changes include merging both industry (except construction) and manufacturing into manufacturing and separating information & communication into its own distinct category, previously grouped within wholesale, retail, transportation, & electric.

Figure 6.1 illustrates, for each sector, the share of global employment listed in the sector as a percentage of domestic employment in the sector (blue) and the share of domestic employment in the sector as a percentage of total Nordic employment (green). The dashed blue line is adjusted for foreign employees in listed companies. An increase in the blue line indicates a growing share of sector employees working for listed firms compared to private firms. An increase in the green line indicates that the sector's employment is growing relative to overall Nordic employment. The sectors of wholesale, retail, transportation and electricity (19%), along with mining and construction (7%), and finance, insurance and real estate (3%), have maintained a stable share of Nordic employment throughout the period. Manufacturing (20%) and agriculture, forestry, & fishing (9%) have experienced a significant decrease in their share of employment, with decreases of 31% and 25% between 1993 and 2023. Meanwhile, services and information & communication saw notable increases, from 8.6% and 2.4% in 1993 to 15.2% and 3.8% in 2023, representing increases of 77% and 58%. In 1993, manufacturing had the highest employment, employing 28.8% of the Nordic workforce, followed closely by the public sector at 28.5%. In 2002, the public sector exceeded manufacturing as the largest employer and held this position until 2023, accounting for 30% of total employment compared to manufacturing 20%.

[9] Agriculture, forestry & fishing = 0, Mining & construction = 1, Manufacturing = 2-3, Wholesale, retail , transportation & electric = 4-5 (ex. 48), Information & communication = 48, Finance, insurance & real estate = 6, Services = 7-8, and Public administration = 10.

[10] Creades AB = 6211, Affaersstrategarna AB = 3674, Haki Safety AB = 3990, Kinnevik AB = 7372, Latour Investment AB = 6799, Saga Pure ASA = 4991, VNV Global AB = 6799, Aker ASA = 1311, Arendals Fossekompani ASA = 7372, Aspo PLC = 4412, Bonheur ASA = 4911, Idun Industrier AB = 2045, KH Group Oyj = 6799, Lifco AB = 3843, Orkla ASA = 2033, Storskogen Group AB (Publ) = 6799, Det Østasiatiske Kompagni A/S = 4449, Aligro Planet Acquisition Co = 6799, Hunter Group ASA = 4412, Lifeline Spac I Oyj = 6799, Det Stasiatiske Kompagni A/S = 2099, ICA Group AB = 2024, Elkem ASA = 3339, Sdiptech AB = 8742, Aega ASA = 4911, Strax AB = 5999,

[11] Agriculture, forestry and fishing = 0; Industry (except construction) and Manufacturing = 2/3; Construction = 1; Wholesale and retail trade, transport, accommodation and food services = 4/5 (excluding 48); Information and communication = 48; Financial and insurance activities' and 'Real estate activities = 6; Professional, scientific and technical activities; administrative and support services, Arts, entertainment and recreation; other services = 7/8; Public administration, defense, education, health and social work = 10

Figure 6.1: Employment distribution by sector in the Nordics (1990–2023). The blue line shows listed companies share of sector employment, the green line shows sector employment as a share of total Nordic employment, and the dashed blue line indicates adjusted listed companies employment within each sector.

The sectors with the highest percentage of employment in listed companies in 2023 were manufacturing (57%), finance, insurance & real estate (55%), and services (44%). In total,

these sectors globally employed around 2.9 million people, 52% of employment in the listed sector, and 20% of Nordic employment. Manufacturing (1.7 million), services (1.0 million) and wholesale, retail, transportation, and electric (0.6 million) have the most employees in listed firms, which makes them the most important sectors in this study. In contrast, mining & construction (16%), agriculture, forestry & fishing (9%) and information & communication (8%) were the sectors with the lowest percentage of employment in listed companies in 2023. These sectors had a combined global workforce of 230 thousand people, with 12% employment in the listed sector, representing 0.16% of total Nordic employment. Since 1993, the manufacturing sector has consistently had the highest number of listed employees. From 1993 to 2010, the finance, insurance and real estate sector had the highest share of listed employees within the sector. After 2010, manufacturing surpassed it, leading both in total numbers and in percentage of listed employees.

Figure 6.1 also illustrates the listed employment adjusted for foreign employment in each sector. In all sectors, the contribution of domestic listed firms to employment is lower than their global impact, with foreign affiliates becoming more important over time. The adjusted figures generally follow the same trends as the global listed employment, but with smaller fluctuations. In 2023, the sectors with the lowest share of foreign employees include information & communication (40%), mining & construction (28%), agriculture, forestry & fishing (26%), and finance, insurance & real estate (24%). In contrast, sectors such as wholesale, retail, transportation & electric (62%), services (60%) and manufacturing (59%) have the highest share of foreign employees. For these sectors, the share of foreign affiliate employees as a percentage of domestic employees evolved from 39%, 167%, and 69% in 1993 to 161%, 149%, and 143% in 2023. As a result, domestic listed employment of Nordic employment remained relatively stable over the period compared to global listed employment in the sectors. In 2023, domestic employment in listed companies represented 23% in manufacturing, 18% in services, and 8% in wholesale, retail, transportation, and electric, however, in 1993 this percentage was where 17%, 7% and 5%.

Our analysis shows that the largest sectors differ in their share of employees working for listed companies in 2023. The largest sector, public administration, employed 4.4 million people and 30% of Nordic employment. From 1993 to 2023, the public administration experienced a growth of 1 million employees (30%). Although this is an interesting topic for discussion, it falls outside the scope of this study. However, this trend suggests that if public administration continues to expand, listed companies are likely to represent a smaller proportion of the overall workforce. Manufacturing, the second largest sector, employs 3 million people in 2023, with 57% globally employed by listed companies; however, 59% of these are foreign employees, leaving only 23%

domestic listed employment. The third largest sector, wholesale, retail, transportation, & electricity, has 2.9 million employees in 2023, with 20% working for publicly listed companies. However, because foreign employees make up 62% of the listed workforce, adjusted domestic employment drops to 8%. Services, the fourth largest sector, employs 2.3 million people, with 44% global employment in listed firms. However, adjusted for 62% by foreign subsidiaries, the share of domestic employment is only 18%. Together, these four sectors represented 84% of the Nordic workforce in 2023, with listed companies representing only 26% of global employment and 11% of domestic employment. In general, sectors are poorly represented on the stock market, especially when accounting for foreign affiliates.

As shown in Figure 5.1 in Part 5, the share of global employment by listed firms, as a percentage of total Nordic employment, increased by 12 percentage points between 1993 and 2023, with a sharp rise between 1993 and 2000. This growth is mainly driven by the increase in employment in listed companies within the three largest sectors: manufacturing, services and wholesale, retail, transportation & electric. Listed global employment in these sectors increased from 11% in 1993 to 22% in 2023, an increase of 1.9 million workers. Figure 5.1 shows that domestic employment by listed firms only increased by three percentage points. This is because the largest sectors consistently had the highest proportion of foreign workers, with the share steadily increasing over time. Adjusted for foreign employment, the employment listed as a percentage of Nordic employment in the three sectors was 13% in 2023 compared to 7% in 1993. This explains why the large increase in listed employment is not observed when we adjust for foreign employees.

Among the three largest sectors, manufacturing remains the largest despite decades of decline, while the service sector has absorbed most of the workforce, experiencing rapid growth in recent years (in addition to the public sector). This aligns with global trends in industrialization, digitization, and higher living standards. Meanwhile, the wholesale, retail, transportation, & electric sector has consistently been a major contributor to overall employment. In all three sectors, the share of publicly listed companies has shown an upward trend, reflecting a pattern where the largest companies dominate the stock market, continue to grow, and drive industry consolidation. When sector employment decreases (or increases), one would generally expect a proportional increase (or decrease) in the share of listed company employees, assuming that their workforce remains constant. However, in manufacturing, the share of listed employment has grown disproportionately compared to the sector's decline. Meanwhile, the service sector has experienced an increase in listed employment alongside workforce growth. This indicates that both sectors have contributed significantly to the overall increase in the listed employment share, with the service sector being

the primary driver of this growth. Note that two major players, ISS A/S and Securitas AB, drive the Nordic service sector, employing 560,000 in 2023, with 7% in the Nordics. The drop in 2004 and the increase in 2014 reflect the delisting of the ISS during this period. Over time, the listed share of employment in these three sectors has grown at a faster rate than total Nordic employment during the same period; however, a large part of the growth has occurred in foreign affiliates, which has limited the growth in listed domestic employment share.

6.2 A shift-share analysis

Shift-share analysis provides a structured approach to understand the developments in different sectors. The shift-share analysis presents relative changes in employment in sectors by comparing the employment shares of listed companies with Nordic employment[12]. This approach divides employment changes into two components: the shift effect, which measures changes in the share of employment within an industry held by public companies, and the share effect, which represents changes in employment share across the broader economy. Analyzing both effects provides a clearer understanding of the changing role of listed companies in different sectors.

Panel A in Table 6.1 shows an increasing presence of listed companies from 1993[13] to 2023, with the share of employment in listed companies growing from 13% to 25%. This growth is driven by a positive shift effect of 13.24 percentage points, in which all sectors experienced an increase in the share of listed employment in the period. This shows a trend of an increasing concentration of employment in listed companies. As discussed above in part 6.1, the sectors where listed companies captured the largest share of the workforce include manufacturing, services, wholesale, retail, transportation, & electricity, specifically driven by companies such as ISS A / S, Securitas AB, Hennes & Mauritz AB, and Møller-Maersk A/S. For example, Hennes & Mauritz grew its employment from 7,586 in 1993 to 143,000 in 2023, an increase of 1,785%. However, these multinational companies have a significant portion of their workforce outside the Nordics, which requires adjustments for foreign employees. Panel B of Table 6.1 provides the analysis after adjusting for foreign employment. The share of domestic employees in listed companies of Nordic employment increases from 8% in 1993 to 11% in 2023, an increase of 3 percentage points. The

[12]The approach to the shift-share analysis is based on the methodology used by Elsby et al. (2013). $s_{i,t}$ represent the share of total employment attributed to industry i at time t, $x_{i,t}$ denote the proportion of industry i's total workforce employed by listed firms, and $a_{i,t}$ capture the share of total employment accounted for by listed firms within industry i. These relationships are connected by the equation: $a_{i,t} = s_{i,t} \times x_{i,t}$. The change in $a_{i,t}$ from one period to the next can be expressed as: $a_{i,t} - a_{i,t-1} = 0.5 \times (s_{i,t} + s_{i,t-1}) \times (x_{i,t} - x_{i,t-1}) + 0.5 \times (x_{i,t} + x_{i,t-1}) \times (s_{i,t} - s_{i,t-1})$. The first term captures the shift effect, while the second captures the share effect.

[13]"The analysis begins in 1994 for the information and communication sector and in 1998 for the agriculture, forestry, and fishing sector, as data on listed companies in these sectors is unavailable prior to these years."

shift effect is positive at 3.53 percentage points, indicating that listed companies have increased their share of domestic employment. However, this shift effect is reduced compared to panel A, reflecting a more modest increase when only including domestic contributions.

The negative share effect highlights that employment growth among listed companies has lagged behind the overall expansion of the broader economy. This is mainly driven by the manufacturing sector, where total employment has declined as a share of the economy, falling from 29% in 1993 to 20% in 2023. At the same time, listed firms have captured an increasing share of the sector's workforce, rising from 27% in 1993 to 57% in 2023. The contraction of manufacturing, combined with the growth in sectors with fewer listed firms, has limited the overall employment growth of listed companies relative to the broader economy.

In contrast, the service sector was the fastest growing sector in the economy between 1993 and 2023. The sector shows dual growth, with the employment share of listed companies increasing from 20% to 44% and the sector's share of Nordic employment increasing from 9% to 15%. The growth was driven by a 2.94 percentage point shift effect and a 2.11 percentage point share effect. Meanwhile, the adjusted figures are lower; both effects remain positive. This reflects the increasing influence of listed companies in the service sector and the overall growth of the sector.

The analysis also reveals notable trends in other sectors. The wholesale, retail, transportation, & electric sector consistently contributed significantly to employment, maintaining its share of Nordic employment with a neutral share effect. At the same time, the sector is gaining a larger presence on the stock exchange, with a positive global shift effect of 2.46 percentage points and a domestic shift effect of 0.46 percentage points. Further, the agriculture, forestry, & fishing sector, vital to the Norwegian economy, has experienced significant employment growth among listed companies. Globally, the listed share increased from 0.13% in 1993 to 8.74% in 2023, or from 0.1% to 6.51% when adjusted for foreign employment. A global shift effect of 0.26 percentage points and a domestic effect of 0.19 percentage points reflect the sector's growing importance on listed companies. At the same time, the overall contribution of the sector to the economy has declined with a negative share effect of 0.05 percentage points. This aligns with global trends of sector consolidation and industrialization, while in the Nordics, the increase in listed companies is driven by Norway's rise as a global leader in salmon farming.

Panel A: Change in the percentage of global employment of listed firms by sectors								
	All firms			Public firms			Shift-share analysis	
Sector	1993	2023	Change	1993	2023	Change	Shift	Share
Agriculture, forestry & fishing	3.69	2.29	-1.41	0.13	8.74	8.562	0.26	-0.05
Finance, insurance & real estate	2.99	3.04	0.06	43.80	54.92	11.12	0.34	0.03
Information & communication	2.44	3.88	1.45	5.93	8.12	2.19	0.07	0.10
Manufacturing	28.80	19.90	-8.90	27.21	57.03	29.82	4.26	-3.75
Mining & construction	4.76	6.70	1.94	11.61	15.81	4.21	0.24	0.27
Services	8.64	15.23	6.59	19.78	44.38	24.60	2.94	2.11
Wholesale, retail, transportation & electric	19.26	19.25	-.01	7.31	20.07	12.76	2.46	0.00
Total economy	100	100	0.00	12.81	25.22	12.40	13.24	-1.34
Panel B: Change in the percentage of adjusted employment of listed firms by sectors								
	All firms			Public firms			Shift-share analysis	
Sector	1993	2023	Change	1993	2023	Change	Shift	Share
Agriculture, forestry & fishing	3.69	2.29	-1.41	0.13	6.51	6.38	0.19	-0.05
Finance, insurance & real estate	2.99	3.04	0.06	38.01	41.61	3.60	0.11	0.02
Information & communication	2.44	3.88	1.45	5.93	4.85	-1.08	-0.03	0.08
Manufacturing	28.80	19.90	-8.90	16.85	23.48	6.63	1.61	-1.79
Mining & construction	4.76	6.70	1.94	9.72	11.35	1.63	0.09	0.20
Services	8.64	15.23	6.59	7.28	17.81	10.53	1.26	0.83
Wholesale, retail, transportation & electric	19.26	19.25	-0.01	5.27	7.68	2.40	0.46	0.00
Total economy	100	100	0.00	8.09	11.23	0.76	3.53	-0.74

Table 6.1: Panel A shows the global employment distribution by sector for all and public firms in 1993 and 2023, alongside percentage changes. Columns 1–3 report sectoral employment for all firms, Columns 4–6 for public firms, and Columns 7–8 provide the shift-share analysis, where "Shift" indicates changes in the proportion of sectoral employment attributed to public firms over time, and "Share" reflects changes in the sector's overall contribution to total employment. Panel B uses adjusted employment data to account for foreign activities.

7 How well does a companies market capitalization reflect its economic contribution?

Building on the analysis of employment and value added among listed companies, we now examine how well market capitalization captures a company's economic contribution. A company is seen as less representative if its market capitalization share of the total market differs from its share of the total contribution. This section investigates unrepresentativeness by comparing a firm's market capitalization to employment and value added. The analysis employs regression models to capture both linear and nonlinear relationships, while also examining whether these patterns remain stable over time.

7.1 Unrepresentativeness

To understand how well market capitalization represents economic contribution, we calculate yearly unrepresentativeness (U). This measure is developed by Schlingemann and Stulz (2022)

and is calculated by summing the absolute percentage deviation between each companies' market capitalization weights and their economic contribution weights. It is a measure of how unaligned market valuations are with employment or value added contributions. We derive the unrepresentativeness in the following.

Let w_i denote the market capitalization weight of the company i, calculated as the ratio of its market capitalization to the total market capitalization of all listed companies. Similarly, L_i represents company ii's weight of total employment, defined as the ratio of its employment to the total employment of all listed companies. Lastly, V_i represents company i's weight of total value added, calculated as the ratio of its value added to the total value added by all listed companies. Our focus is on the difference between w_i and L_i or V_i. Since the direction of the difference is not relevant, we use the absolute value. To quantify employment unrepresentativeness (U(E)) and value added unrepresentativeness V(A), we calculate the sum of the percentage absolute deviations between market capitalization weights and employment or value added weights for all n listed companies. This is expressed as:

$$U(E) = \frac{1}{2}\sum_{i=1}^{n}|w_i - L_i| \times 100\% \qquad U(VA) = \frac{1}{2}\sum_{i=1}^{n}|w_i - V_i| \times 100\%.$$

U(E) increases proportionally to the average absolute percentage difference. If a company's market capitalization and employment share are both 50%, U(E) is zero. A mismatch, such as 50% market capitalization but 25% employment, increases U(E) by 25%. U(E) is zero when market capitalization aligns perfectly with employment shares but can reach 100% in the cases of complete misalignment.

Figure 7.1 shows the employment unrepresentativeness (U(E)) among listed companies in the Nordics between 1990 and 2023. Its shows industrial (green) and public (blue) unrepresentativeness and the dashed lines are adjusted domestic U(E). In general, employment unrepresentativeness shows large variations over the period, but with an increasing trend, similar to the results from the United States (Schlingemann & Stulz, 2022). Industrial and public companies had their lowest U(E) in 1994 (30.4% and 34%, respectively) and peaked in 1999 (52.3%) and 2000 (56.4%). This shows a divergence between valuations and economic fundamentals at the peak of the dot-com bubble. After this, we observe a sharp decline followed by a gradual upward trend over the last two decades, with U(E) reaching its highest level in 2023, apart from the peak in 2000. For both measures, U(E) is generally higher when financial companies are excluded, but the results remain similar.

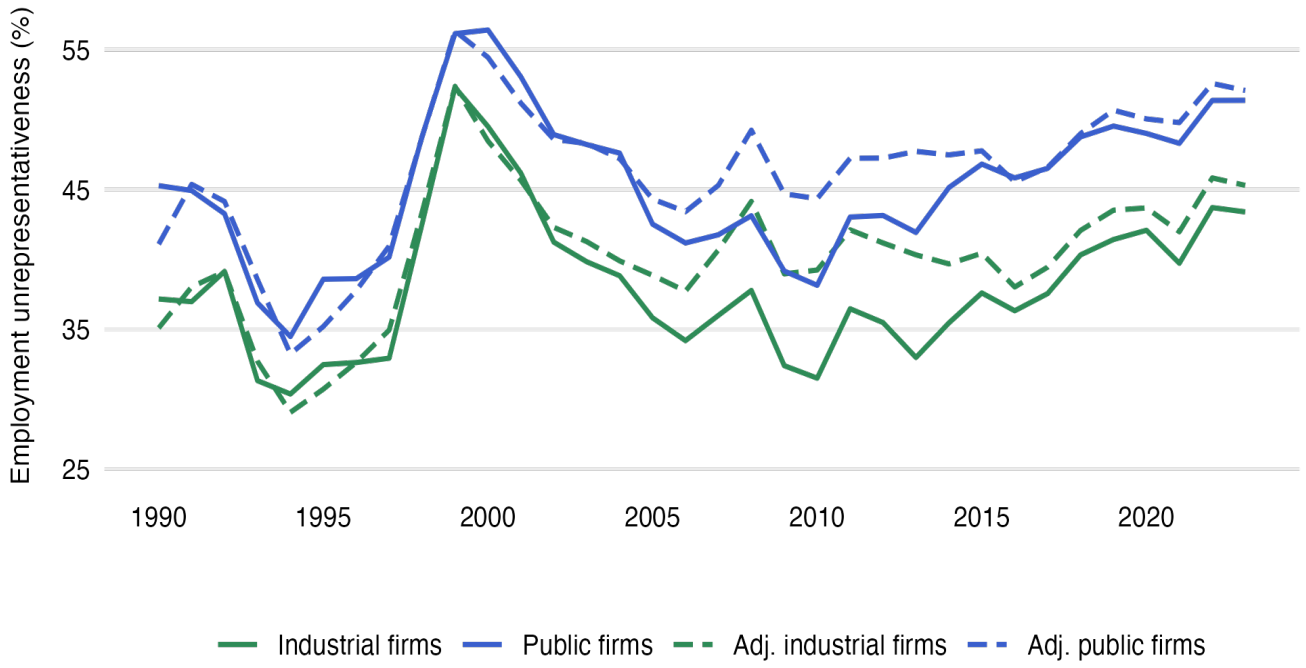

Figure 7.1: Employment unrepresentativeness (U(E)) (1990–2023). The solid lines represent global U(E), while the dashed lines shows adjusted domestic U(E). U(E) measures the degree to which market capitalization reflects employment contribution.

Value added unrepresentativeness (U(VA)) for listed companies is shown in Figure 7.2 between 1990 and 2023. The solid lines represent the global unrepresentativeness of industrial and public companies, while the dashed line represents the domestic U(VA). The measure follows a similar pattern as employment unrepresentativeness with larger fluctuations. Industrial and public companies reached their peak in the early 2000s at 24% and 23%. We also observe elevated U(VA) for public firms (incl. finance sector) during the global financial crisis in 2008. Public companies recorded their lowest unrepresentativeness in 2005 at 21.5%, while industrial companies reached their lowest in 2009 at 23.1%. In these periods, market valuations aligned more closely with economic output, likely due to repricing following market bubbles and economic shocks. After 2010, we see a gradual increase in U(VA), approaching the highest levels since 1990 at the end of the period. The domestic U(VA) for both industrial and public companies is consistently higher but remains similar when financial companies are excluded.

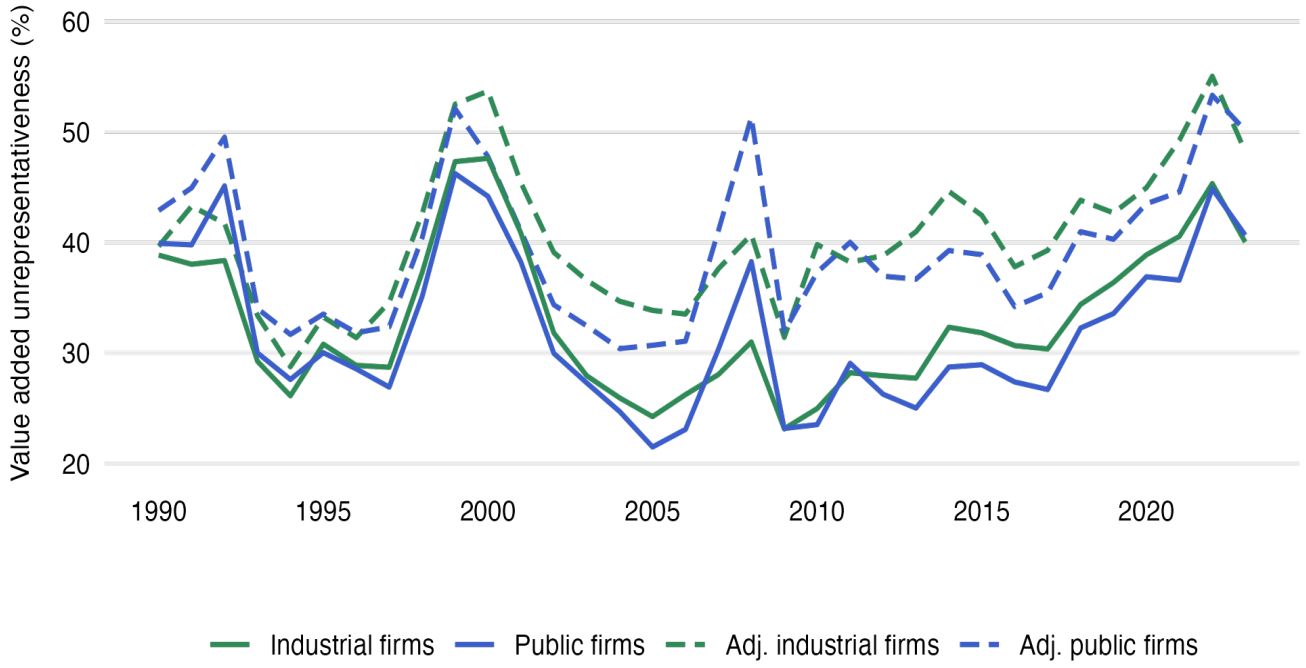

Figure 7.2: Value added unrepresentativeness (U(VA)) (1990–2023). The solid lines represent global U(VA), while the dashed lines shows adjusted domestic U(VA). U(VA) measures the degree to which market capitalization reflects value added contribution.

Table 7.1 show the slope coefficients that would result from a linear trend estimation of the unrepresentativeness measures. We present global and domestic U(E) separately, analyzing both industrial and public firms. The analysis is carried out with and without the period 1999–2001, as this period is characterized by unusually large values. We also apply the Kendall Tau test, a non-parametric statistic that evaluates the strength and direction of the relationship between two variables, time and unrepresentativeness, offering additional support for the robustness of the parametric results.

Panel A in Table 7.1 reveals a marginally positive and statistically significant trend in the measure of global employment unrepresentativeness for industrial firms, which is further confirmed by the positive Kendall-Tau correlation. Excluding the years 1999–2001 reveals clearer trends, as slope coefficients increase and adjusted R^2 gives more explanatory power for both industrial and public firms, indicating a more consistent trend without these outliers. Public firms show limited evidence of a clear trend, as neither the slope coefficient nor the Kendall Tau correlation is statistically significant. However, when outliers are excluded, both metrics become statistically significant. We repeat the same analysis in Panel B with employment unrepresentativeness adjusted for foreign affiliates. The trends align with those in Panel A, but in all cases, the slope coefficients, both parametric and non-parametric, are more statistically significant (1% significance level). This

reflects a clear disconnect between market capitalization and domestic employment contributions.

Panels C and D in Table 7.1 provide the estimated trends for the global and domestic value added unrepresentativeness. The findings indicate that trends in value added unrepresentativeness are less pronounced than those observed for employment unrepresentativeness. For global value added, there is no significant trend in the entire sample. The domestic value added are positive and statistically significant for the parametric and non-parametric for industrial firms. For public firms its only positive and significant on the non-parametric correlation when we exclude the year 1999-2001 from the sample.

Panel A: Employment unrepresentativeness U(E)

		Parametric			**Non-parametric**	
Sample	Exclude 1999–2001	Slope coefficient	p-value	Adj-R^2	Kendall Tau correlation	p-value
Industrial firms	No	0.168*	0.070	0.071	0.280**	0.020
Industrial firms	Yes	0.225***	0.005	0.214	0.371***	0.003
Public firms	No	0.084	0.355	-0.004	0.191	0.117
Public firms	Yes	0.148**	0.039	0.106	0.274**	0.028

Panel B: Adjusted employment unrepresentativeness U(E)

		Parametric			**Non-parametric**	
Sample	Exclude 1999–2001	Slope coefficient	p-value	Adj-R^2	Kendall Tau correlation	p-value
Industrial firms	No	0.270***	0.001	0.257	0.394***	0.001
Industrial firms	Yes	0.322***	0.000	0.465	0.504***	0.000
Public firms	No	0.211**	0.010	0.164	0.316***	0.008
Public firms	Yes	0.267***	0.000	0.304	0.415***	0.001

Panel C: Value added unrepresentativeness U(A)

		Parametric			**Non-parametric**	
Sample	Exclude 1999–2001	Slope coefficient	p-value	Adj-R^2	Kendall Tau correlation	p-value
Industrial firms	No	0.018	0.765	-0.028	0.080	0.517
Industrial firms	Yes	0.052	0.312	0.002	0.145	0.252
Public firms	No	-0.034	0.595	-0.022	-0.037	0.177
Public firms	Yes	-0.004	0.947	-0.033	0.016	0.910

Panel D: Adjusted value added unrepresentativeness U(A)

		Parametric			**Non-parametric**	
Sample	Exclude 1999–2001	Slope coefficient	p-value	Adj-R^2	Kendall Tau correlation	p-value
Industrial firms	No	0.127**	0.022	0.127	0.326***	0.006
Industrial firms	Yes	0.161***	0.001	0.295	0.415***	0.001
Public firms	No	0.066	0.272	0.007	0.166	0.174
Public firms	Yes	0.094	0.102	0.056	0.234*	0.062

Table 7.1: Panel A and B show results for employment unrepresentativeness (U(E)) and adjusted U(E). Panel C and D present the results for value added unrepresentativeness (U(A)). Columns 3–5 report slope coefficients, p-values, and adjusted R-squares from linear trend regressions, and Columns 6–7 show Kendall Tau correlation coefficients with p-values. Adjusted measures account for foreign affiliates. Results are shown including and excluding 1999–2001. Significance levels : * ($p < 0.1$), ** ($p < 0.05$), *** ($p < 0.01$).

An alternative way to analyze the relationship between market capitalization and employment and

value added is to assess how well these variables explain the cross-sectional variation in market capitalization. For example, if market capitalization were a fixed multiple of employment for all companies, a regression of market capitalization on employment would yield an R^2 of 1, indicating perfect explanatory power. To investigate this, we run yearly cross-sectional regressions of market capitalization against employment and value added for listed companies. The resulting R^2 statistics provide insights into how these variables explain market capitalization across companies and over time. Notably, these regressions are more influenced by the largest companies.

Figure 7.3 illustrates the statistics R^2 for both global and domestic data during the period 1990 to 2023. The graph on the left shows the regressions of market capitalization on employment over time. Global data reveal a decreasing ability of employment to explain variations in market capitalization. The values of R^2 exceeded 35% during the 1990s and 2000s but decreased steadily, falling below 10% at the end of the sample period. In contrast, domestic figures, which account for foreign employment, reveal a consistently higher explanatory power. These results indicate that employment explains a small fraction of the variation in market capitalization, suggesting that other factors play a more significant role. In addition, its explanatory power has decreased over time.

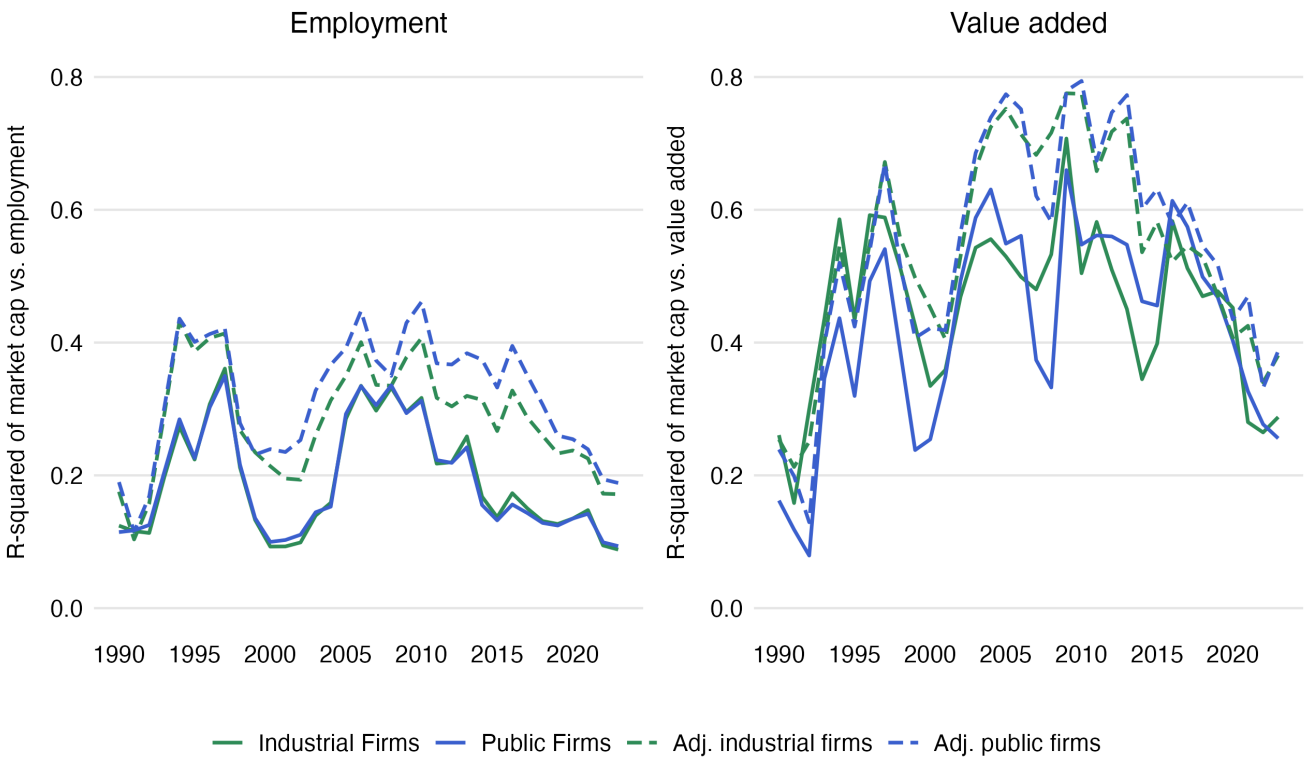

Figure 7.3: Evolution of R-squared statistics. The graphs show yearly R-squared values from cross-sectional regressions of market capitalization on a single independent variable from 1990 to 2023. The left panel uses employment as the independent variable, while the right panel uses value added. Solid lines represent unadjusted R-squared values, and dashed lines account for foreign activities.

The graph on the right in Figure 7.3 plots the statistic R^2 from the regressions of market capitalization on value added, comparing global and domestic numbers. Throughout the sample period, the added value consistently shows a stronger explanatory power for market capitalization compared to employment, with R^2 values surpassing 60% for both global and adjusted figures across multiple periods. The adjusted R^2 values are generally slightly higher than the global figures. Both global and adjusted R^2statistics exhibit a similar trend, peaking in the mid-1990s and again around 2010, followed by a notable decline throughout the 2010s. Despite these fluctuations, value added remains a significantly more robust predictor of market capitalization compared to employment.

7.2 Market valuation

Periods of increased unrepresentativeness often align with surges in market valuations, such as during the dot-com bubble in the early 2000s. To better understand these patterns, this analysis incorporates Shiller's cyclically adjusted price-to-earnings ratio (CAPE)[14] aggregated for the Nordic market, illustrated in Figure 7.4.

CAPE is a metric that compares a company's stock price with its earnings, using inflation-adjusted earnings over the past 10 years. It offers a long-term view of the value by smoothing out the volatility of short-term earnings. As we only had access to CAPE data at the country level, we calculated the Nordic CAPE by weighting each country's CAPE based on its share of the Nordics' total market value each year. CAPE data for Finland were unavailable before 1996. As shown in Figure 7.4, market valuations peaked around 2000 and 2008, while reaching their lowest point in 2009.

[14]The data is provided by Augur Labs for each country separately.

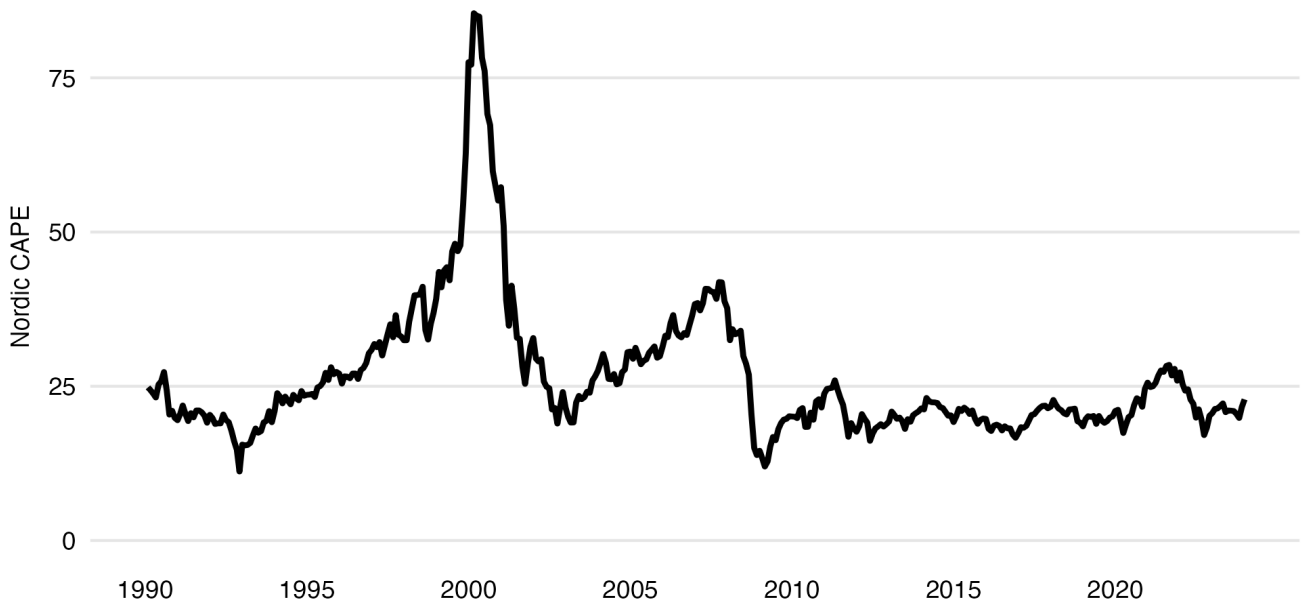

Figure 7.4: Nordic CAPE (1990-2023). The CAPE index reflects aggregated market valuations adjusted for inflation and smoothed using a 10-year average of earnings.

Table 7.2 presents the regression results that examine the relationship between CAPE and unrepresentativeness in both employment and value added. For industrial companies, the results of Model 1 show that CAPE has a significant positive relationship with employment unrepresentativeness ($\beta = 0.263, p < 0.01$), indicating that higher market values are associated with greater misalignment between the market values of a company and its share of employment. Similarly, for public firms, Model 3 finds a significant positive relationship between CAPE and $U(E)$ ($\beta = 0.220, p < 0.01$). However, the coefficients on the squared CAPE values are never significant, which could suggest that the relationship between market valuations and unrepresentativeness does not reveal a meaningful non-linear component. This implies that the effect of CAPE on unrepresentativeness remains relatively consistent across its range, without dramatic changes at very high or low levels of CAPE.

For value-added unrepresentativeness $U(A)$, the results for industrial firms in Model 1 indicate a weak but significant positive relationship between CAPE and $U(A)$ ($\beta = 0.111, p < 0.10$), suggesting that higher market valuations marginally increase value added unrepresentativeness. A similar pattern is observed for public companies, where CAPE is significant in Model 3 ($\beta = 0.132, p < 0.05$). As observed with $U(E)$, the coefficients in CAPE^2 are not significant for industrial or public firms. In the appendix, additional regressions using foreign-adjusted values for unrepresentativeness are presented (Table A.1). Although the overall patterns of employment unrepresentativeness remain consistent, the results become less significant than for the global figures. Furthermore, CAPE for

value added unrepresentativeness is no longer significant, suggesting that the adjustments may weaken the observed relationship between market valuations and value added unrepresentativeness.

Panel A: Employment unrepresentativeness $U(E)$				
	Industrial firms		**Public firms**	
	(1)	(2)	(3)	(4)
CAPE	0.263***	0.067	0.220***	-0.085
	(0.070)	(0.321)	(0.078)	(0.355)
CAPE^2		0.002		0.004
		(0.004)		(0.004)
Intercept	31.121***	34.286***	39.438***	44.377***
	(2.004)	(5.473)	(2.225)	(6.040)
Observations	34	34	34	34
R^2	0.303	0.311	0.198	0.217
Adjusted R^2	0.281	0.267	0.173	0.167
Residual Std. Error	4.351 (df = 32)	4.393 (df = 31)	4.831 (df = 32)	4.848 (df = 31)
F Statistic	13.879*** (df = 1; 32)	7.000*** (df = 2; 31)	7.884*** (df = 1; 32)	4.302** (df = 2; 31)
Panel B: Value added unrepresentativeness $U(A)$				
	Industrial firms		**Public firms**	
	(1)	(2)	(3)	(4)
CAPE	0.111*	-0.157	0.132**	-0.151
	(0.055)	(0.248)	(0.050)	(0.222)
CAPE^2		0.003		0.004
		(0.003)		(0.004)
Intercept	13.118***	17.458***	12.984***	17.576***
	(1.568)	(4.226)	(1.416)	(3.788)
Observations	34	34	34	34
R^2	0.112	0.145	0.180	0.223
Adjusted R^2	0.084	0.090	0.155	0.173
Residual Std. Error	3.404 (df = 32)	3.392 (df = 31)	3.074 (df = 32)	3.040 (df = 31)
F Statistic	4.021* (df = 1; 32)	2.636* (df = 2; 31)	7.038** (df = 1; 32)	4.448** (df = 2; 31)

Table 7.2: Time-series regressions of unrepresentativeness measures on the Shiller CAPE index. Panel A presents results for $U(E)$, while Panel B reports results for $U(A)$. The independent variables include the Shiller cyclically adjusted price-to-earnings ratio (CAPE) and its squared term (CAPE^2) in even-numbered models. Models (1) and (2) are estimated on industrial firms, and models (3) and (4) include all listed (public) firms. Coefficients are reported with robust standard errors in parentheses. Significance levels : * ($p < 0.1$), ** ($p < 0.05$), *** ($p < 0.01$).

To provide a clearer illustration of the relationship, we plot, in figure 7.5, the unrepresentativeness of employment and the value added against the CAPE index for each regression specification presented in Table 7.2. In general, the results indicate that periods of high CAPE are associated with greater disparities between market values and the economic contributions of firms, particularly for employment.

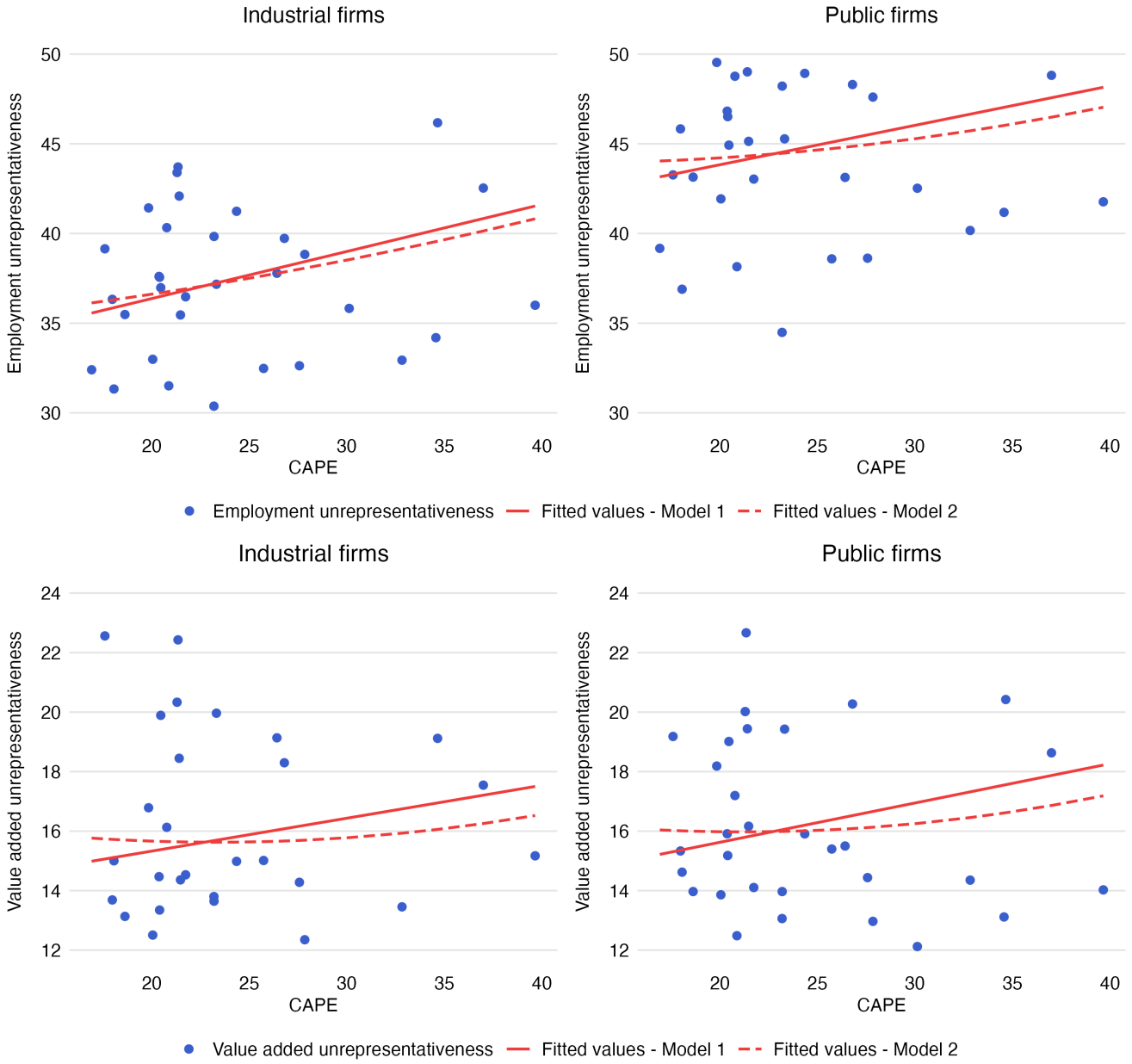

Figure 7.5: Relationship between unrepresentativeness and CAPE. Each graph illustrates the relationship between the annual CAPE and measures of employment unrepresentativeness (top row) and value-added unrepresentativeness (bottom row) for industrial firms (left column) and public firms (right column). The solid lines represent the fitted values from the linear regression models, while the dashed lines represent the fitted values from the quadratic regression models, following the specifications in Table 7.2. The scatter points represent the observed data for the unrepresentativeness measures across the CAPE values.

7.2.1 Key takeaways

This part analyzes the extent to which market capitalization reflects a company's economic contributions, specifically employment and value added. Over time, market capitalization has become a less reliable indicator of employment, as unrepresentativeness (U(E)) has increased since 1990, particularly when adjusting for unusually high market values around 2000. In contrast, the connection to value added has remained stable despite fluctuations during economic disruptions such as the dot-com bubble, the financial crisis, and post-2020, and it has no significant time

trend. We also observe that the explanatory power (R^2) for employment is at its lowest point in 2023, while it remains at a higher level for value added. In addition, we find a significant positive relationship between CAPE and unrepresentativeness, suggesting that higher market valuations are associated with a greater disconnect between market value and economic contributions, particularly for employment. Higher CAPE values, often driven by investor expectations of future earnings growth, widen the gap between market valuation and current economic contributions, particularly during periods of optimism and low interest rates. These dynamics may have contributed to the observed increase in unrepresentativeness after 2010.

8 Are the largest listed firms gaining economic importance?

In the last section, we analyze how the role of the largest listed companies has changed over time. This perspective shows the concentration of economic influence among a few dominant firms and explores how changes in these companies impact the broader economy. The analysis focuses on trends among the top one, three and ten firms by market capitalization. In addition, we assess the economic impact of these leading firms at the sector level. Note that these results are based on global figures, which means that they provide an upper limit on the actual contribution to the Nordic economy.

To determine the market capitalization of companies, we used data from Compustat Global Security Daily. This data goes back to 1987, and contains many types of securities and companies. We only included securities classified as common or preferred shares (TPCI[15]) and companies listed on Nordic stock exchanges, as described in Part section 4. We multiply the number of outstanding shares (CSHOC) by the year-end stock price (PRCCD) to find market capitalization. For companies with multiple classes of securities, such as shares A and B, we aggregated these values to calculate the total market capitalization. To ensure consistency, stock prices in different currencies were first converted to USD and then to NOK.

Figure 8.1 shows the market capitalization of the largest company in the Nordic region from 1987 onward, adjusted to a billion NOK using the 2015 CPI. During this period, only six companies have the top positions, but it clearly reflects market trends in different periods. Initially, ABB AB (three years), Astra AB (seven years), and Ericsson AB (one year) dominated, representing a period of relative stability until the late 1990s. The late 1990s saw a surge in market capitalization, primarily driven by Nokia OYJ (eleven years) during the dot-com boom. This period of rapid

[15]Including TPCI 0 (Common/Ordinary shares) and 1 (Preferred/Preference shares), while excluding 7 (Mutual or Investment trust fund.), F (Depositary Receipt €) and % (Exchange Traded Fund).

growth was followed by a sharp decline in market capitalization as the bubble burst. After this, market values stabilized at higher levels compared to the pre-boom period. Around 2011, during a period of record high oil prices, Equinor ASA was the largest company for four consecutive years. However, after 2013 Novo Nordisk A/S has been the dominant player, holding the top spot for the past 11 years. The graph shows that the market value of the top firms has generally trended upward, particularly since 2015, with Novo Nordisk reaching record levels in 2023. The dominance of these companies over long periods reflects their strong adaptability, while the rise in market capitalization shows the growing economic concentration of the largest company.

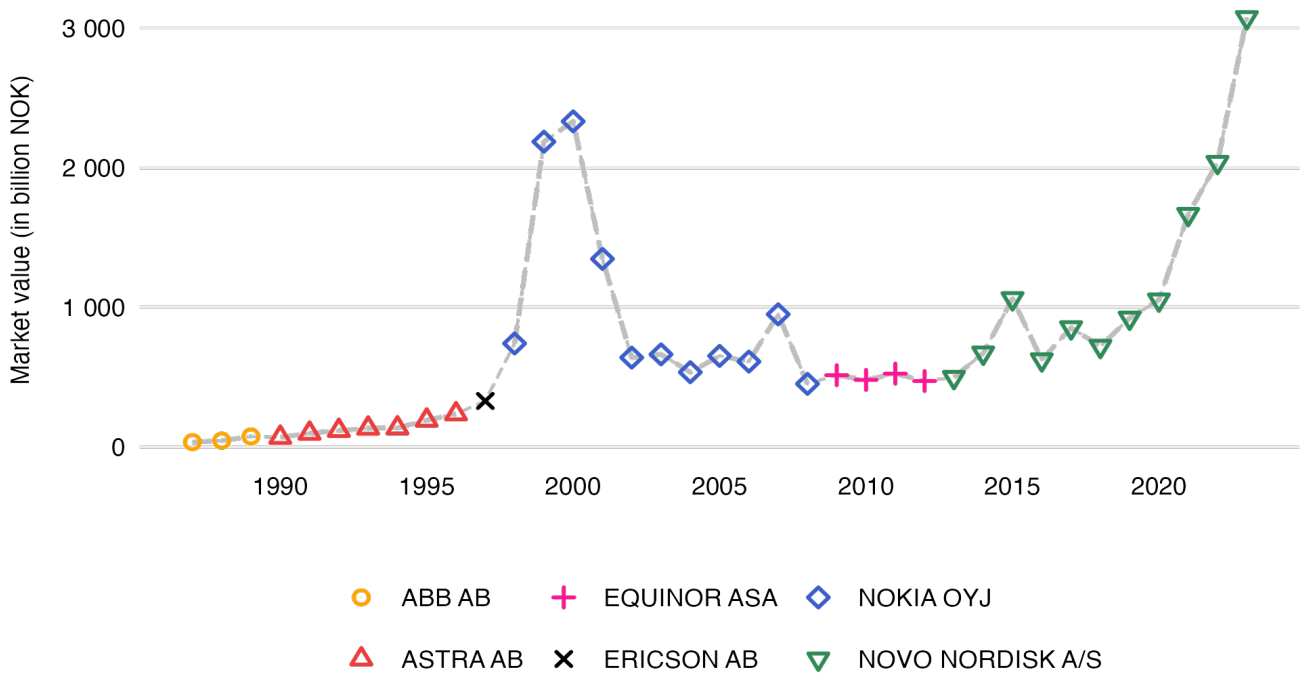

Figure 8.1: Market capitalization of the largest company (1987-2023). This graph shows the market capitalization of the largest firms each year, in billions NOK, adjusted to 2015 CPI. Calculated as shares outstanding (CSHOC) multiplied by year-end price (PRCCD) from Compustat.

Expanding the analysis to include the top three firms each year, Figure 8.2, shows a similar pattern of market concentration. Additional companies such as Ericsson AB, Norsk Hydro ASA, and Nordea Bank AB are represented, but the general trend of dominance by a small number of firms remains. During the period, only 15 distinct companies reached the top three, reflecting a high market concentration. A wide range of sectors are represented among the top firms, including retail, shipping, banking, commodities, and pharmaceuticals. We can also see clear signs of bubbles, particularly represented by IT and telecommunications companies such as Ericsson, Sonera, and Nokia during the dot-com bubble and Orsted during the green bubble in 2020. This variation shows that, while leadership changes to some degree, a small group of companies has consistently

played a major role in shaping the Nordic stock exchanges over the years.

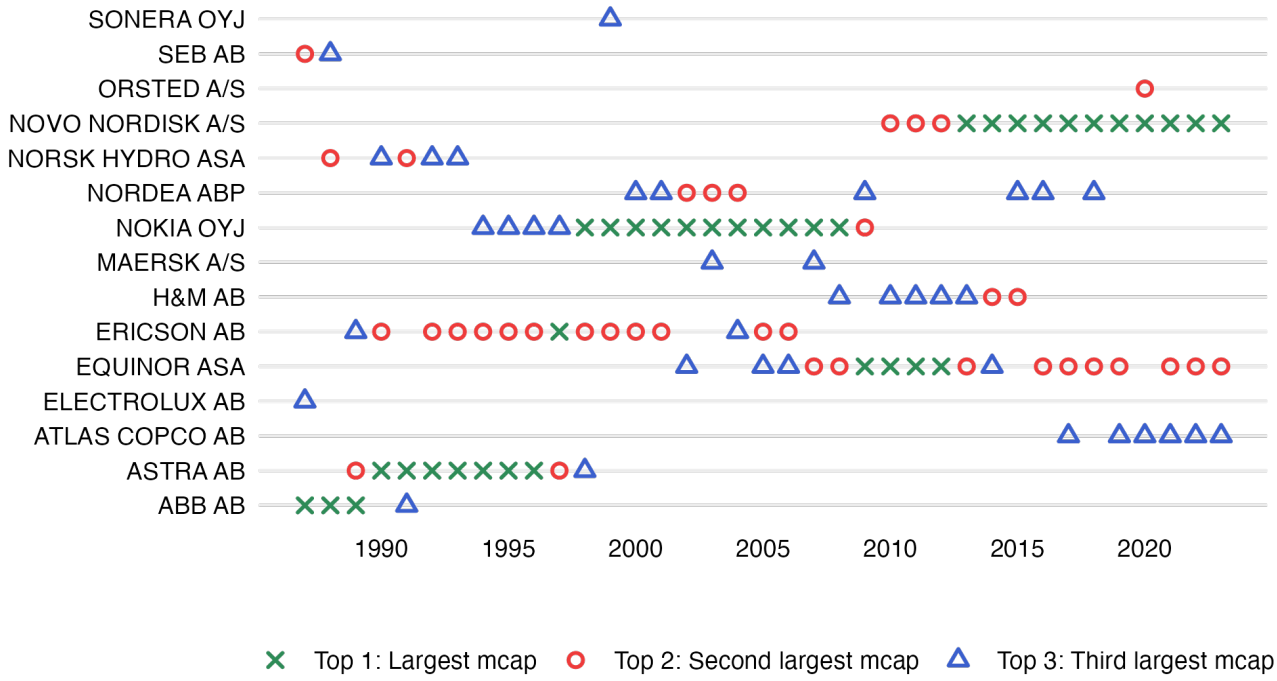

Figure 8.2: Top three companies by market capitalization (1987-2023). The graph shows the largest (#1), second largest (#2), and third largest (#3) firms by market capitalization annually from 1987 to 2023, calculated as shares outstanding (CSHOC) multiplied by year-end price (PRCCD) from Compustat.

Similarly to how the largest company has experienced a rise in value since 1987, the top ten largest companies have shown a similar development. Figure 8.3 shoes the share of market capitalization held by the largest companies in the Nordic region over time, specifically examining the top one, three and ten companies each year. Despite the significant increase in Novo Nordisk's market capitalization in recent years, the percentage share of total market capitalization held by the largest firm was higher during the dot-com bubble, reflecting a period of extraordinary market valuations. After the bubble burst, the market share of the top firms declined and remained relatively stable until a resurgence in 2020. The top ten companies held a 44% market share in 1987, which declined to 34% by 2023, after peaking at 56% in 1999. In 1987, the top three firms collectively represented approximately 17% of the total capitalization of the Nordic market. This share rose to 27% in 2023, reaching a high of 41% in 1999. Similarly, the market share of the largest company increased from 6% in 1990 to 15% in 2023.

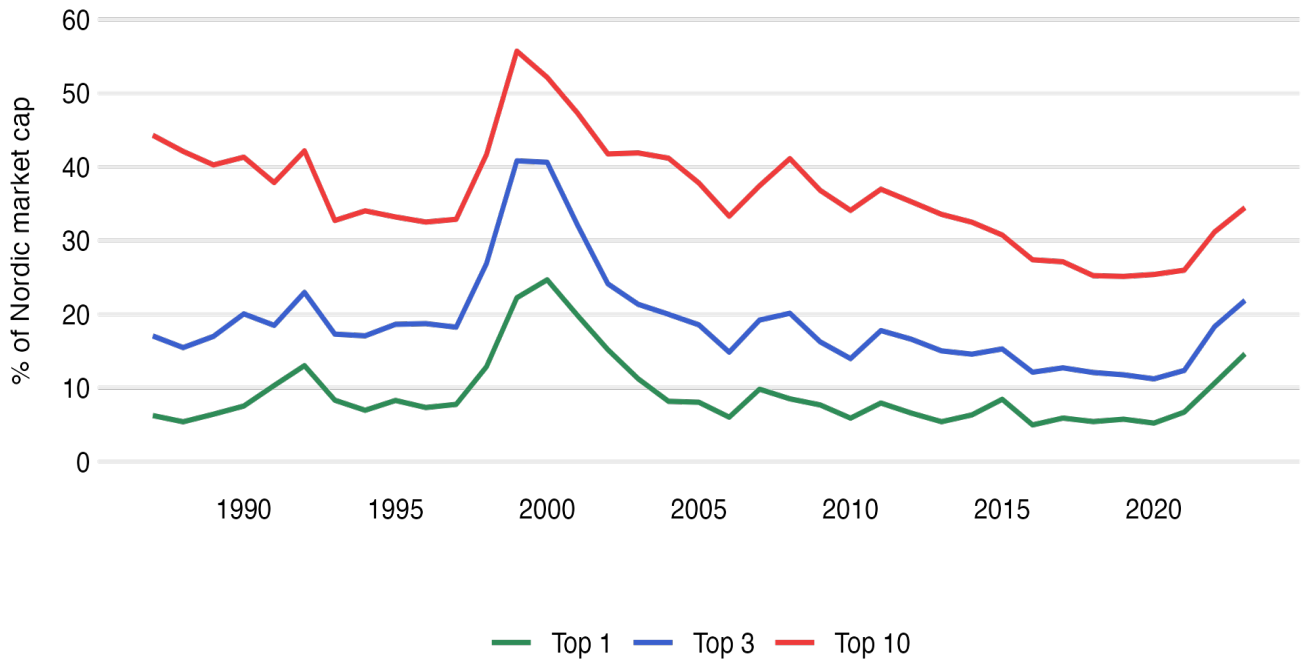

Figure 8.3: Top companies share of Nordic market capitalization (1987-1990). The graph shows the percentage of total market capitalization held by the top 1, 3, and 10 firms from 1987 to 2023. Market capitalization is calculated as shares outstanding (CSHOC) multiplied by year-end price (PRCCD) from Compustat.

Figure 8.4 shows how global contribution of the top capitalization companies of the top one, three, and ten listed companies evolves over time. The left panel computes the share of employment accounted for by the top one, three, and ten market capitalization firms as a percentage of total Nordic employment, while the right panel computes the value added as a percentage of Nordic GDP. The irregular patterns in these plots result from changes in the composition of firms as companies with varying employee counts and revenues enter or exit these categories. Although the market capitalization of the top companies peak in 2000 and remain relatively stable throughout the period, their percentage share of total employment and value added reveals a different pattern.

The share of employment shows that the top ten companies accounted for around 3% of total employment in 1990, peaking at 5% around 2010 before gradually declining below 3% in the end. The three largest companies fluctuate between 1% and 2% share of employment, while the largest company ranges between 0% and 1%. There are significant variations depending on which companies are included, the overall employment share has increased for the top one company while its flat for top three and ten. The value added share reveals that the top ten firms accounted for around 4% of total value added in 1990, reaching a peak of 10% in 2009, before gradually falling to 4% in 2020 and then rising again to 8% at the end of the period. Equinor has a significant

impact on value added, which becomes particularly evident around 2010 and 2022 when oil prices exceeded 100 dollars per barrel. The value added of the top three firms shows the same trends as the top ten, since Equinor is usually a part of this group as well. The contribution of the company with the highest contribution remains below 1%, presented closely in Figure A.1 in the appendix, and reveals a sharp incline and decline during the period when Equinor is the largest company. The results show that while one company dominates market capitalization, its relative impact is distributed among the leading firms, and changes in the group of the leading companies largely affect the contribution. However, while the value-added share has increased across all groups, the employment share has risen only for the largest company.

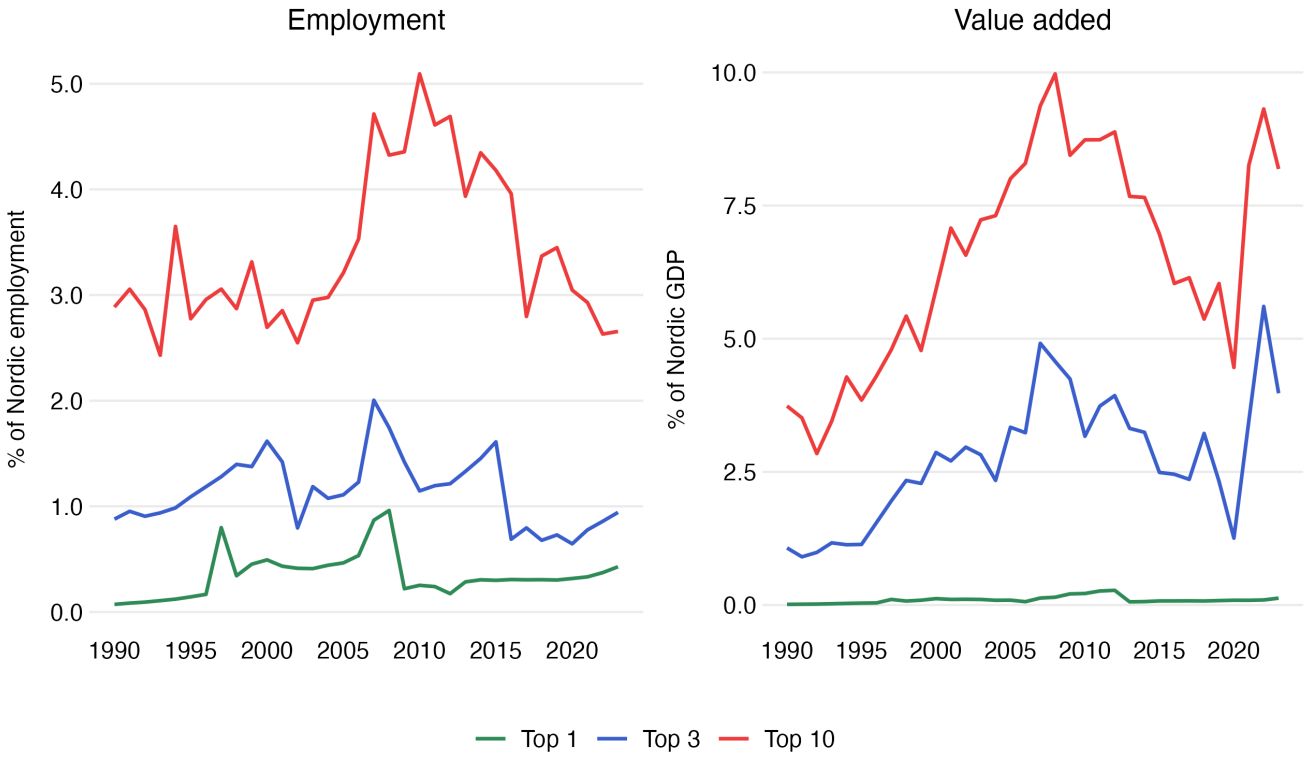

Figure 8.4: Share of employment and value added by the largest companies by market capitalization (1990-2023). The left graph shows the employment share of the top 1, top 3, and top 10 market capitalization firms. The right graph shows the share of GDP contributed by the same firms.

Table 4 provides an overview of the largest companies by market capitalization, employment rank, and value added rank from 1987 to 2023. As illustrated in Figure 8.4, high market capitalization does not necessarily mean high employment or value-added shares. For instance, Astra AB consistently ranked among the top firms by market capitalization from 1990 to 1996, yet its employment rank fluctuated between 19th and 45th. Similarly, Novo Nordisk A/S, the largest company in the last eleven years, has ranked between 10th and 17th in employment. In contrast, Nokia OYJ, the largest company between 1998 and 2008, maintained a strong employment position, ranking within the top ten every year and reaching second place in 2007. Reflecting the large

differences between companies and sectors. Notably, the top market capitalization companies always rank top ten in value added, except for the years before 1993, demonstrating a close alignment between market capitalization and value creation. The average employment rank from 1990 is 16 while the average value added rank is 5.

Year	Name	Country	Market Capitalization		Employment Rank	Value Added Rank
			NOK (Billion 2015)	%		
1987	ABB AB	Sweden	33.56	6.24	1	–
1988	ABB AB	Sweden	44.28	5.39	1	–
1989	ABB AB	Sweden	74.17	6.42	1	–
1990	ASTRA AB	Sweden	67.61	7.53	45	22
1991	ASTRA AB	Sweden	96.90	10.31	45	16
1992	ASTRA AB	Sweden	117.07	13.01	38	12
1993	ASTRA AB	Sweden	133.39	8.32	35	10
1994	ASTRA AB	Sweden	135.23	6.95	28	7
1995	ASTRA AB	Sweden	191.07	8.28	24	8
1996	ASTRA AB	Sweden	236.38	7.33	19	7
1997	ERICSON AB	Sweden	328.82	7.75	3	1
1998	NOKIA OYJ	Finland	741.01	12.87	9	2
1999	NOKIA OYJ	Finland	2187.10	22.22	7	2
2000	NOKIA OYJ	Finland	2333.14	24.66	7	1
2001	NOKIA OYJ	Finland	1347.07	19.83	8	2
2002	NOKIA OYJ	Finland	639.78	15.18	8	2
2003	NOKIA OYJ	Finland	663.02	11.22	8	2
2004	NOKIA OYJ	Finland	535.07	8.16	6	4
2005	NOKIA OYJ	Finland	652.08	8.04	5	4
2006	NOKIA OYJ	Finland	611.29	6.01	4	6
2007	NOKIA OYJ	Finland	950.11	9.81	3	3
2008	NOKIA OYJ	Finland	451.64	8.50	2	3
2009	EQUINOR ASA	Norway	513.49	7.68	22	1
2010	EQUINOR ASA	Norway	479.90	5.88	17	1
2011	EQUINOR ASA	Norway	524.75	7.94	20	1
2012	EQUINOR ASA	Norway	471.89	6.57	25	1
2013	NOVO NORDISK A/S	Denmark	498.03	5.40	16	5
2014	NOVO NORDISK A/S	Denmark	672.56	6.32	17	6
2015	NOVO NORDISK A/S	Denmark	1062.47	8.44	17	5
2016	NOVO NORDISK A/S	Denmark	624.20	4.96	17	5
2017	NOVO NORDISK A/S	Denmark	854.07	5.89	16	4
2018	NOVO NORDISK A/S	Denmark	720.75	5.42	14	4
2019	NOVO NORDISK A/S	Denmark	923.05	5.74	12	4
2020	NOVO NORDISK A/S	Denmark	1053.15	5.21	12	2
2021	NOVO NORDISK A/S	Denmark	1666.46	6.70	12	4
2022	NOVO NORDISK A/S	Denmark	2039.26	10.63	10	4
2023	NOVO NORDISK A/S	Denmark	3076.72	14.61	10	3

Table 8.1: Market capitalization, country, employment and value added rank for the largest company each year (1987–2023). The table lists the largest market capitalization firm (Columns 1–3), its market cap in 2015 CPI-adjusted NOK and as a percentage of the total market (Columns 3–4), and its employment and value-added rankings (Columns 5–6).

Lastly, we examine the economic contribution of the largest companies at the sector level. Figure 8.5 shows the share of market capitalization held by the top three firms within the Fama-French 48 (FF48), Fama-French 17 (FF17), and one-digit SIC classification. Both Fama-French classifications indicate a sharp decline in market concentration. However, we prefer the one-digit SIC classification

because of the limited number of observations, particularly in the early years. The share of market capitalization remains consistent at the beginning and end of the period, with a notable peak in the early 2000s. The development in concentration among leading companies by sector during the period, particularly the increase in the early 2000s, is aligned with Figure 8.3. However, sector leaders are still approximately as important in the stock market now as before and do not exhibit the same increase in market share observed among the largest companies. In addition, Figure 8.6 shows the contribution of global employment and the value added of the top three listed firms to Nordic employment and GDP by sector. Across all classifications, the employment share of the top three companies consistently declines over the period, showing the opposite result compared to what we observed for the largest companies. In contrast, the value added by the largest companies in each sector has increased across all classifications, more than doubling over the period. The share of market capitalization for the largest companies in each sector remains consistent at the beginning and end of the period. However, while these companies contribute less to Nordic employment, they contribute more to GDP. In total, the conclusions are the same as above: listed firms tend to increase value added to the economy, while their contribution in terms of employment is less significant.

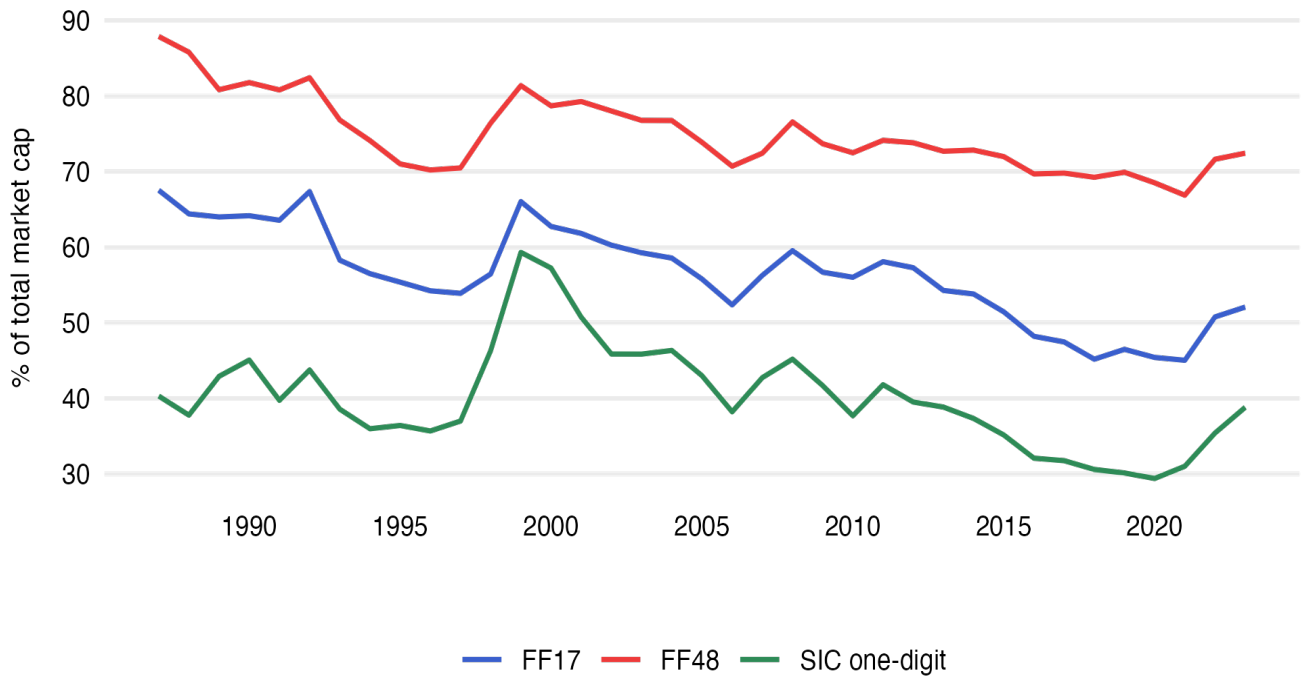

Figure 8.5: Share of total market capitalization by the top three firms in each sector by different classifications (1987-2023). The graph compares the percentage of total market cap represented by the top 3 firms in each sector, classified under FF17, FF48, and SIC one-digit categories.

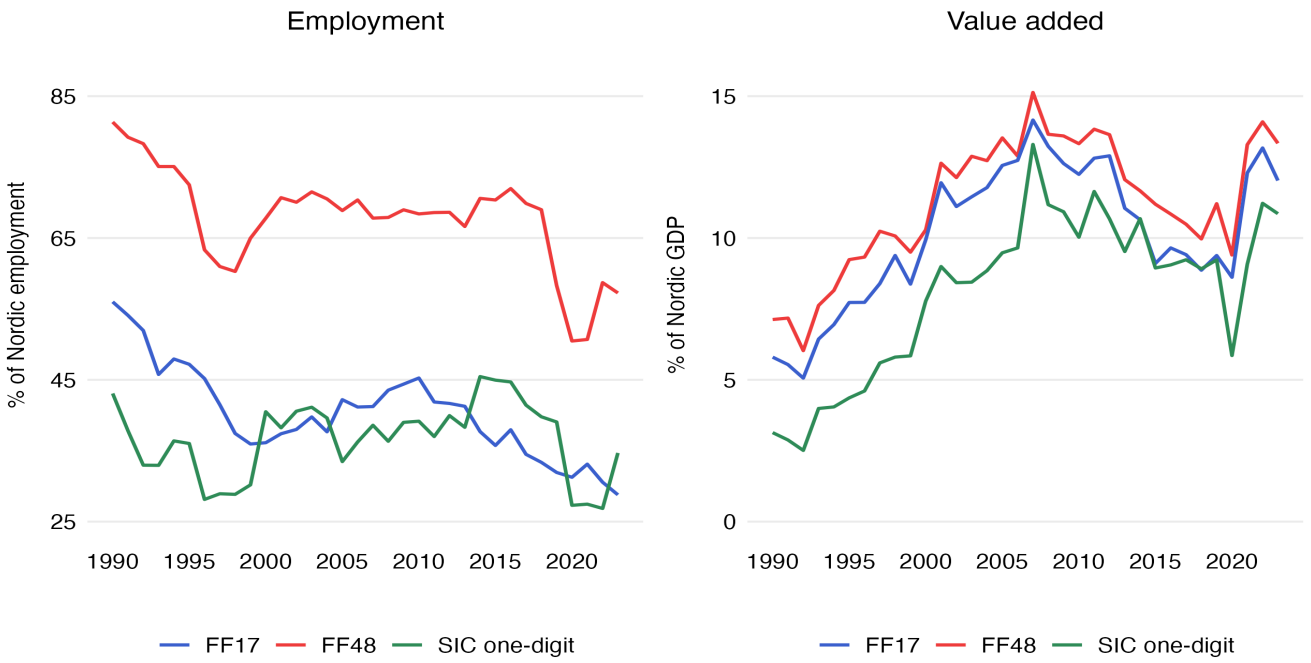

Figure 8.6: Share of employment and value added by the top three firms in each sector by different classifications (1987-2023). The left graph displays the share of Nordic employment represented by firms grouped by FF17, FF48, and SIC one-digit industry classifications. The right graph illustrates the value added contribution of these same classifications to Nordic GDP.

9 Conclusion

Our thesis examines how the contribution of listed companies to the Nordic economy has developed between 1990 and 2023, and assesses how representative market capitalization is as a measure of economic contribution. We find that listed companies increased their contributions to employment and GDP in the Nordic region during the period. We find that growth was particularly strong from 1990 to 2000, followed by a more stable period, but with renewed growth over the past decade. When we account for foreign affiliates, we find that the domestic contribution is more modest. We find that this is primarily because the two largest listed sectors, services and manufacturing, have a high share of foreign workers which continues to grow. The increase in contribution by listed companies is significant, with an increase of 13 and 15 percentage points in employment and value added, respectively, for industrial firms.

When we compare developments in the Nordics and the United States, we find that the trends were similar from 1990 until the last decade. Since 2010, the listed contribution has increased in the Nordics, whereas it has remained flat in the United States. In total, the listed contribution in the United States has remained stable. However, when adjusting for foreign employees, a substantial decline in the United States has been observed since 1990.

An important factor behind the growing economic contribution of listed companies is the changing distribution of employment across sectors. Most of the growth occurred in manufacturing, services, wholesale, retail, transportation & electric, which increased their share of listed employment between 1990 and 2023. We find that listed companies have captured a larger portion of employment within all sectors. However, the overall contraction in manufacturing, combined with growth in sectors with fewer listed companies, has constrained the overall growth of employment of listed companies relative to the broader economy.

Our estimates of the contribution of listed companies to the Nordic economy come with several methodological challenges. Since the employment and value added figures for listed companies include global operations, we use manual adjustments and apply multiple approaches to adjust for foreign revenue and employment. We use three methods: adjustment for the 30 largest employers, adjusting based on sector, and adjusting based on market capitalization, along with a combined approach integrating all three. However, uncertainty remains, as the estimates assume that similar companies share the same proportion of foreign workers and rely on average values for adjustments. In addition, as many companies do not report labor costs, we have made estimates to calculate value added. Inspired by the literature, we estimate the value added by multiplying the number of employees by the industry's median cost per employee. We used multiple methods to estimate the value added, and find that the results are not sensitive to the method. However, our estimates for global employment are more robust, as they rely on fewer assumptions, providing an upper bound of the listed companies contribution. Nevertheless, we find that they follow a trend similar to the value added estimates.

To better understand the economic role of listed companies, we examine how representative market capitalization is for company contributions to employment and value added. In particular, we calculate unrepresentativeness metrics to quantify these discrepancies. We find that market capitalization has become a less reliable indicator of employment contributions over time. In contrast, its alignment with the value added has remained relatively stable. Furthermore, adjustments for foreign affiliates indicate that some of this divergence comes from the increasingly global operations of listed companies. We also find that the explanatory power for employment is at its lowest point in 2023, while it remains at a higher level for value added. In addition, we find a significant positive relationship between CAPE and unrepresentativeness, suggesting that higher market valuations are associated with a greater disconnect between market value and economic contributions, particularly for employment.

Another aspect of this analysis is the evolving economic influence of the largest listed firms.

Between 1990 and 2023, the employment share of the ten largest firms has fluctuated; however, these companies have maintained a consistent level of contributions to employment. At the same time, their concentration of value added has increased, with their total value added doubling since 1990. This concentration, driven by companies like Novo Nordisk, highlights their influence and the need to account for their impact when analyzing broader economic trends.

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Appendices

A Appendix

Figure A.1: Percentage of Nordic GDP contributed by the top 1 market capitalization firm (1990-2023). The graph shows the share of Nordic GDP represented by the firm with the highest market capitalization each year, illustrating its economic impact over time.

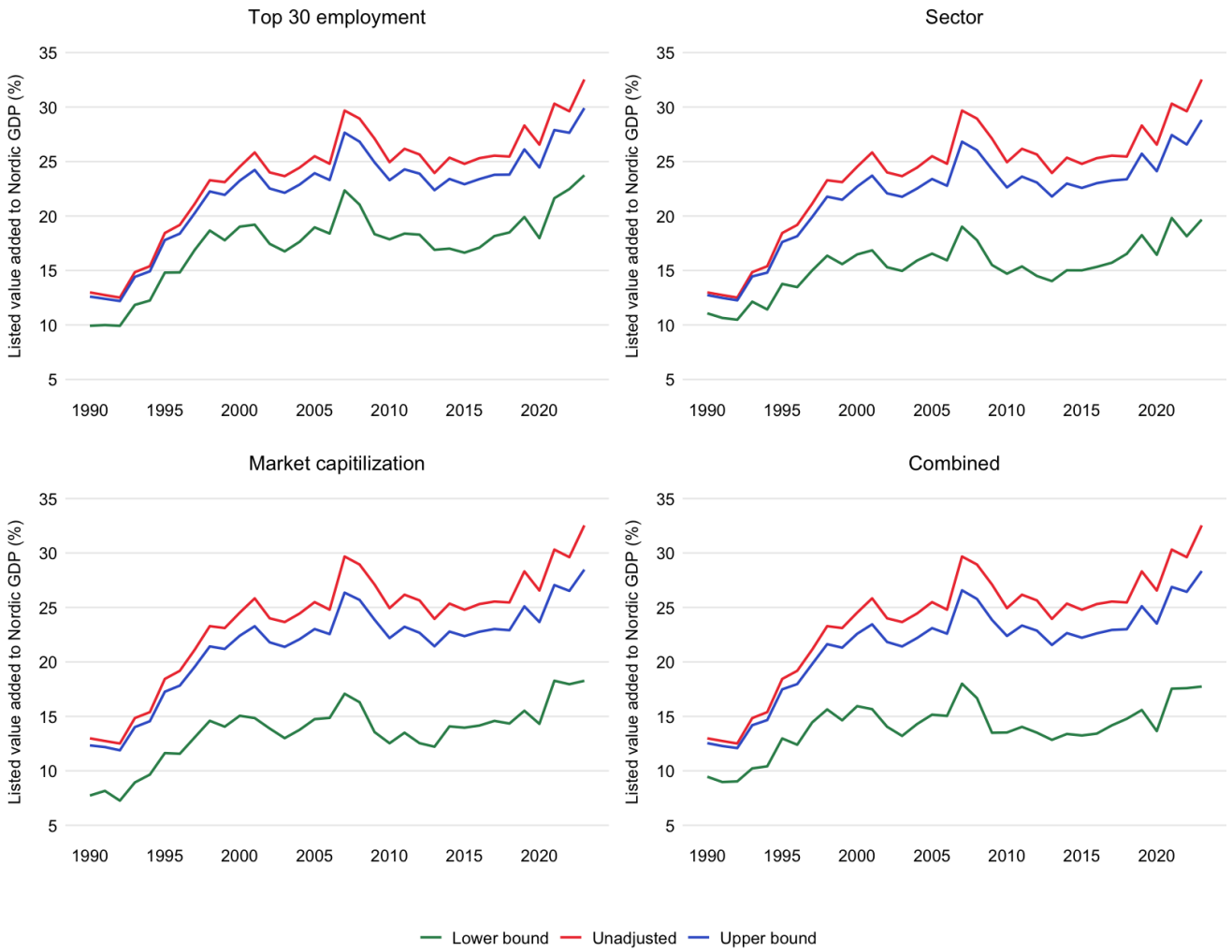

Figure A.2: Four estimates of domestic contribution of listed employment to Nordic employment (1990–2023). The figure shows the share of listed value added to Nordic GDP, estimated using four methods: Top 30 Employment, Sector, Market Capitalization, and Combined. Each panel displays the lower bound (green), unadjusted (red), and upper bound (blue), of the contribution to Nordic economy.

Panel A: Adjusted employment unrepresentativeness $U(E)$				
	Industrial firms		**Public firms**	
	(1)	(2)	(3)	(4)
CAPE	0.191**	-0.032	0.156*	-0.191
	(0.072)	(0.328)	(0.079)	(0.357)
CAPE^2		0.003		0.004
		(0.004)		(0.004)
Intercept	35.217***	38.838***	42.233***	47.872***
	(2.050)	(5.588)	(2.250)	(6.084)
Observations	34	34	34	34
R^2	0.180	0.193	0.109	0.137
Adjusted R^2	0.155	0.141	0.081	0.081
Residual Std. Error	4.449 (df = 32)	4.486 (df = 31)	4.883 (df = 32)	4.884 (df = 31)
F Statistic	7.036** (df = 1; 32)	3.705** (df = 2; 31)	3.907* (df = 1; 32)	2.451 (df = 2; 31)
Panel B: Adjusted value added unrepresentativeness $U(A)$				
	Industrial firms		**Public firms**	
	(1)	(2)	(3)	(4)
CAPE	0.073	-0.201	0.104**	-0.240
	(0.054)	(0.245)	(0.050)	(0.219)
CAPE^2		0.003		0.004
		(0.003)		(0.004)
Intercept	17.744***	22.186***	17.450***	23.034***
	(1.549)	(4.170)	(1.414)	(3.734)
Observations	34	34	34	34
R^2	0.053	0.091	0.121	0.189
Adjusted R^2	0.023	0.033	0.093	0.136
Residual Std. Error	3.364 (df = 32)	3.347 (df = 31)	3.070 (df = 32)	2.997 (df = 31)
F Statistic	1.779 (df = 1; 32)	1.555 (df = 2; 31)	4.393** (df = 1; 32)	3.601** (df = 2; 31)

Table A.1: Employment and Value Added Unrepresentativeness