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The value of age diversity:

Companies with age diverse boards are less risky and more resilient

Foreword

Age diversity creates value

In this study, we provide evidence that there is an association between age diversity and a company's financial performance: age diversity contributes to a higher solvency ratio, given the level of profitability. Achieving the same levels of profitability with less risky balance sheets is value-enhancing, as the corporate finance theory states. When an optimal level of age diversity in boards is reached, Dutch companies could gain up to €51.8bn in added combined value, or on average increase their book value by 1.8%.

With that, this research adds a dimension to the ongoing debate about the value of more diversity in teams. Over the past years, the importance of diversity in terms of cultural background and gender in appointing board members has been discussed more regularly, and rightly so. But at most organisations, differences in perspective between generations are not yet part of the diversity agenda. Mostly, when new board members are appointed, the years of experience someone brings is still the primary consideration, leading to a relatively high average age of board members. Hence, companies are missing out on the potential to create value.

We believe that the power of diversity by bringing different perspectives allows for better decisions. The way problems, dilemmas and opportunities are viewed and judged is changing by using diverse teams. We encourage boards to think about this and discuss it with each other. Have you analysed the age diversity on your board? Does your board have a sufficient range of diversity in thought? Could a new, and possibly younger board member bring knowledge and expertise you currently lack?

In this research we make the case that age diversity matters. We solidify our conclusions with data from thousands of companies and give numerical estimates of the potential value creation that optimal age diversity could bring. That's really worth a discussion.

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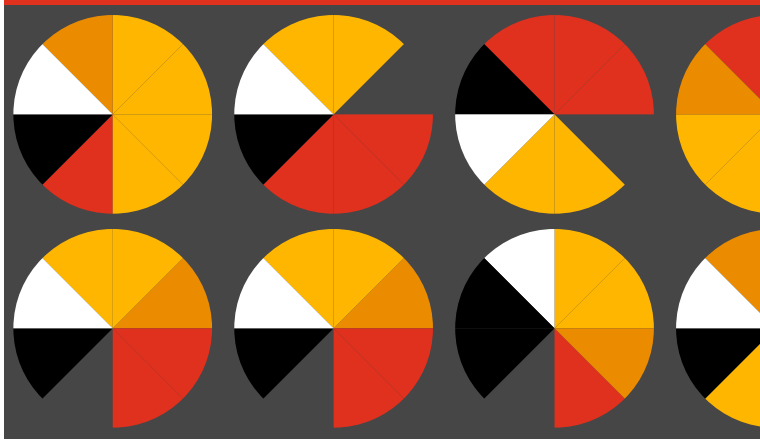


Rethink age diversity

Experience and mileage may not be the primary age criteria for board member selection

We live and work in an age of unprecedented diversity in gender, race, ethnicity, disability, sexual orientation and religion[1]. Age diversity, intriguingly, tends to be overlooked. Especially on company boards.

Historically, age and experience were seen as the paramount criteria for board members. But as the challenges facing businesses are growing in complexity, that might not be the case anymore[2]. Older directors have the benefit of decades of work and board experience. But boards that do not include younger voices are lacking a different perspective. This added point of view might be crucial to raising the entire board's performance in times when world views of companies, governments and customers are changing rapidly.

Age diversity on company boards[3] is financially beneficial

Age diversity is an important aspect in the composition of effective company boards. It is about the right combination of generational viewpoints. Various studies have noted that age diversity brings out the best in terms of skills, knowledge and know-how of different generations. That can consequently improve discussions and strategic decision-making.

59%

of the Dutch population is under the age of 50...

Base: 252 directors.
Source: Company.info

...yet only

13%

of Dutch Boards in our dataset have an average age of less than 50.

Young directors make up just

15%

of board seats in AEX listed companies.[14]

In addition, more age-diverse teams can tap into a wider network of resources and incorporate preferences and viewpoints of larger consumer segments into their decisions.

In this paper, we add an important finding: there is a significant correlation between age diversity in boards and the financial performance of companies. And that can create value.

An optimum amount of age diversity gives the most benefits

As it turns out, there is an optimum level of age diversity. Around it, the value potential is maximised.

That means there can be too little or too much age diversity. Proper management is important to ensure the negative aspects of age diversity, such as differences in communication, workstyles and incentives, do not overshadow the benefits.

However, most companies do not even come close to that optimum level. As our study indicates, just one of every 15 Dutch companies is close to it. Thus, there is a lot of untapped potential.

What we found in terms of age diversity on boards:

- *Age diversity contributes to a higher company solvency ratio, improving resilience, reducing risk and creating value*

In a sample of 11,000 companies, we found a strong relationship between age diversity and solvency ratio. A higher solvency ratio indicates a company's ability to meet its long-term financial obligations. In other words, it contributes to resilience and reduces exposure to risk. That ultimately creates more value: the same level of profitability can be achieved with a less risky balance sheet.

- *Dutch companies could gain up to €51.8bn in value*

We found that there is an optimal level or 'goldilocks level' of age diversity. If Dutch companies in our sample reached the optimal board age diversity level, they could gain up to €51.8bn in total value. In terms of the domestic market capitalization of Euronext Amsterdam (€1.2tn in November 2022[4]), that would be equivalent to €21.9bn, or the value of a company such as DSM[5].

Every reason to rethink age diversity

In most companies age diversity is not even part of the diversity and inclusion agenda. Moreover, the average age of board members is relatively high (see page 3) and boards are still quite homogenous. It is time to start reflecting on board age diversity, questioning whether the right policies are in place.

What do you think about age diversity?

In this publication, we provide evidence that there is a link between age diversity and a company's financial performance. In the final chapter (pages 10 and 11), we discuss other benefits arising from the literature. We aim to encourage reflection on the age composition of boards.

The following questions might be helpful:

- **Does your board have a sufficient range of diversity in thought?**
- **Have you analysed the age diversity on your board, or the average age of your directors?**
- **Are there key areas where your board lacks current expertise, such as technology or consumer preferences?**
- **Could a new, and possibly younger board member bring this knowledge?**
- **Does age diversity even play into considerations for new board members?**
- **Does your board have an updated succession plan?**

Age is not part of the diversity, equity and inclusion agenda

In PwC's 2017 Corporate Directors Survey, 91% of directors stated that age diversity is either very or somewhat important for diversity of thought in the boardroom[6]. This high number seems in contrast to the fact that 60% companies globally and in the Netherlands[7] have a diversity, equity and inclusion agenda, while only 8% include age in it[8].

Despite increasing calls for board rejuvenation, the average age of boards does not decrease

Furthermore, the average age of board members and directors is rising steadily[9], while younger generations are still absent and underrepresented at the C-suite level. In the Netherlands, the average age of a male supervisory director is around 64 years, while for women it is 58 years[10]. The average age of a chairman is 66.5 years[11].

Even though companies are starting to recognize the value of younger directors, the progress is very slow. Only 13% of Dutch companies have boards with an average age of less than 50, even though 59% of the Dutch population is younger than 50[12]. Of AEX companies, only 15% of directors are younger than 50[13].

Having experience on both the executive and supervisory board level is understandable is a defendable argument. However, only relying on this aspect can create homogeneity in the board and potentially miss out on other factors that might be equally or even more important.

How age diversity creates value

Our results indicate a strong correlation between company board[15] age diversity and solvency ratio. It means that in general, for companies with comparable levels of earnings, those with higher age diversity have a higher solvency ratio, but up to a certain point: there is an optimum level. For companies with low age diversity, there is potential to increase age diversity to this optimum level. That would lead to a higher solvency ratio and more value as the company's risk-return trade-off improves. Similarly, those who have too much age diversity should move back to the optimum level. Although in our sample that might be the case only for 2.1% of companies.

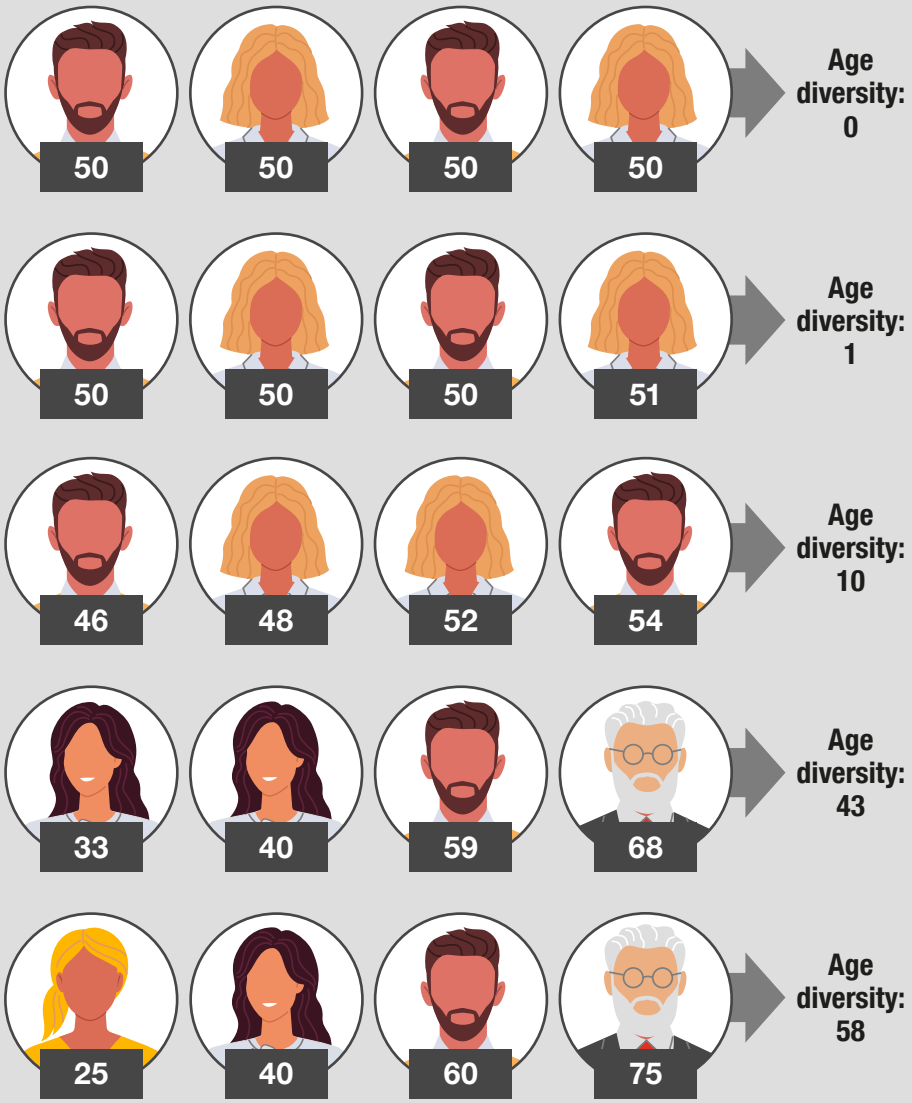
What data do we use?

We use Orbis database[16] which incorporates a large array of company financial and board demographic variables. In our case, the sample consists of 11,558 companies in five European countries, including 3,672 in the Netherlands. This sample includes only companies with more than one board member, ten or more employees and more than €2m in revenue. Details on the methodology are available in the Appendix 1 (page 14).

Are simply younger boards also more age-diverse?

Age diversity is a more telling measure than average age. Company boards that have low average age do not necessarily have low age diversity and vice versa (see Appendix 1 on page 15). Age diversity, in contrast to average age, indicates the qualitative aspects of board composition in terms of different generations.

The five following boards have about the same average age (50), but completely different compositions. Similarly as in the literature, we use the coefficient of variation (standard deviation of board age divided by board average age) as our measure of age diversity. In this example, the larger the age diversity indicator is, the more spread out the ages of the board members are. Zero in the age diversity indicator means that all board members have the same age. We adjust it so that the highest age diversity value in our sample is equal to 100 and align all others proportionally. We find that the optimum age diversity indicator is 43 (not to be confused with average age).

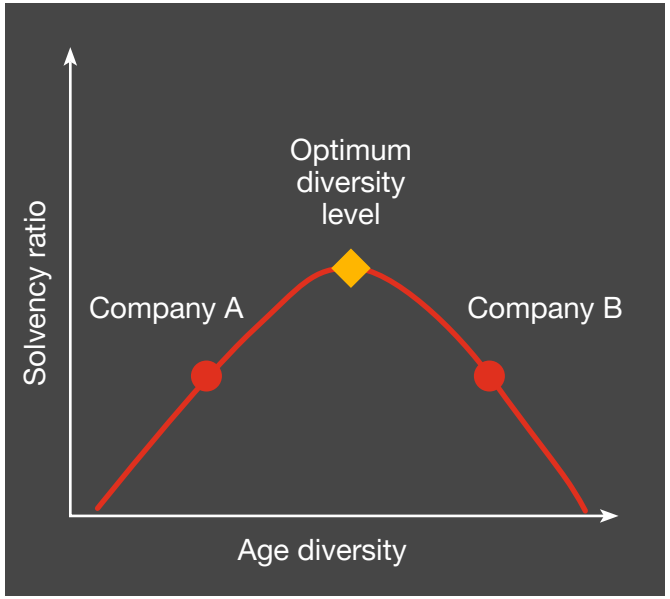


What is the correlation between board age diversity and solvency ratio?

Controlling for company assets, number of employees, company board size, company age, earnings level and industry, our analysis indicates that companies with very low age diversity on boards can gain up to 0.25 percentage points in solvency for every one point increase in age diversity indicator. But the relationship is more complex as the effect is higher when age diversity is lower.

We identify a positive relationship between age diversity and solvency ratio, and a negative relationship between age diversity squared and solvency ratio. In other words, age diversity increases solvency ratio, but only up to a certain point. Our results align with existing studies that also find an optimum level[17,18]. We identify that this point is when the age diversity indicator is equal to 43.

Companies can be positioned on a curve of age diversity and solvency ratio, with those below or above the optimum level losing potential value. One can imagine this relationship as a hill. For example, company A is not at the peak yet – and could gain more value if it increased its age diversity, while Company B could gain more value if it decreased its age diversity as it is already past the peak of the hill.



Do companies have enough board age diversity?

The immediate answer usually is no. As an exact age diversity of 43 is hard to achieve and too strict of a criteria, we define an optimal age diversity range between 36.5 and 49.5 (15% from the optimum point of 43). The graph on the next page shows the percentage of companies within this range by industry. In general, we could say that the lack of age diversity is more of a concern than an abundance – only 2.1% of companies are above the optimum point in our sample.

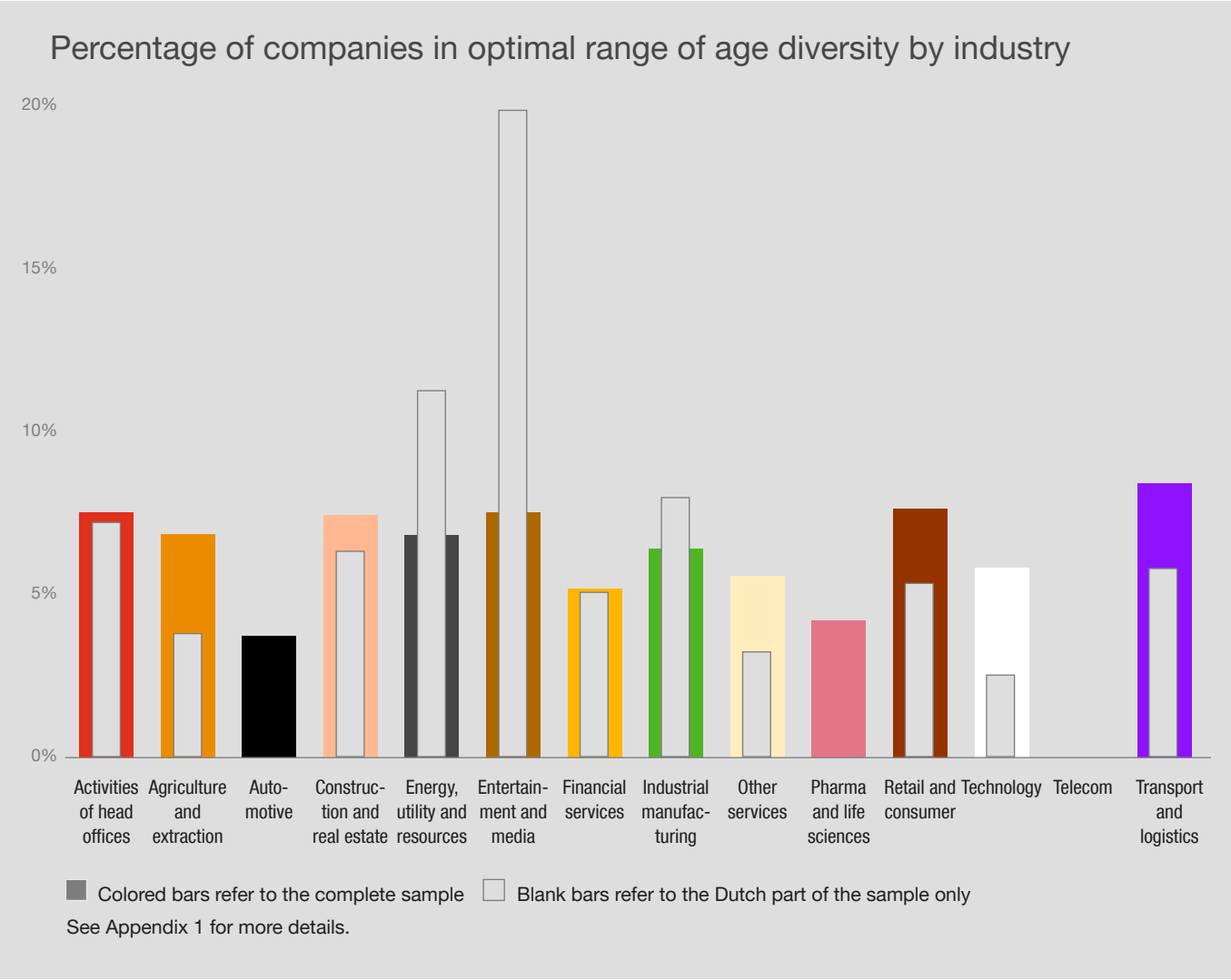
What could this mean in practice?

Assuming a Dutch company with 10 board members and a generational shift every 5 years.

45 45 45 45 45 45 60 60 60 60 *Age diversity – 23*

From two generations to five

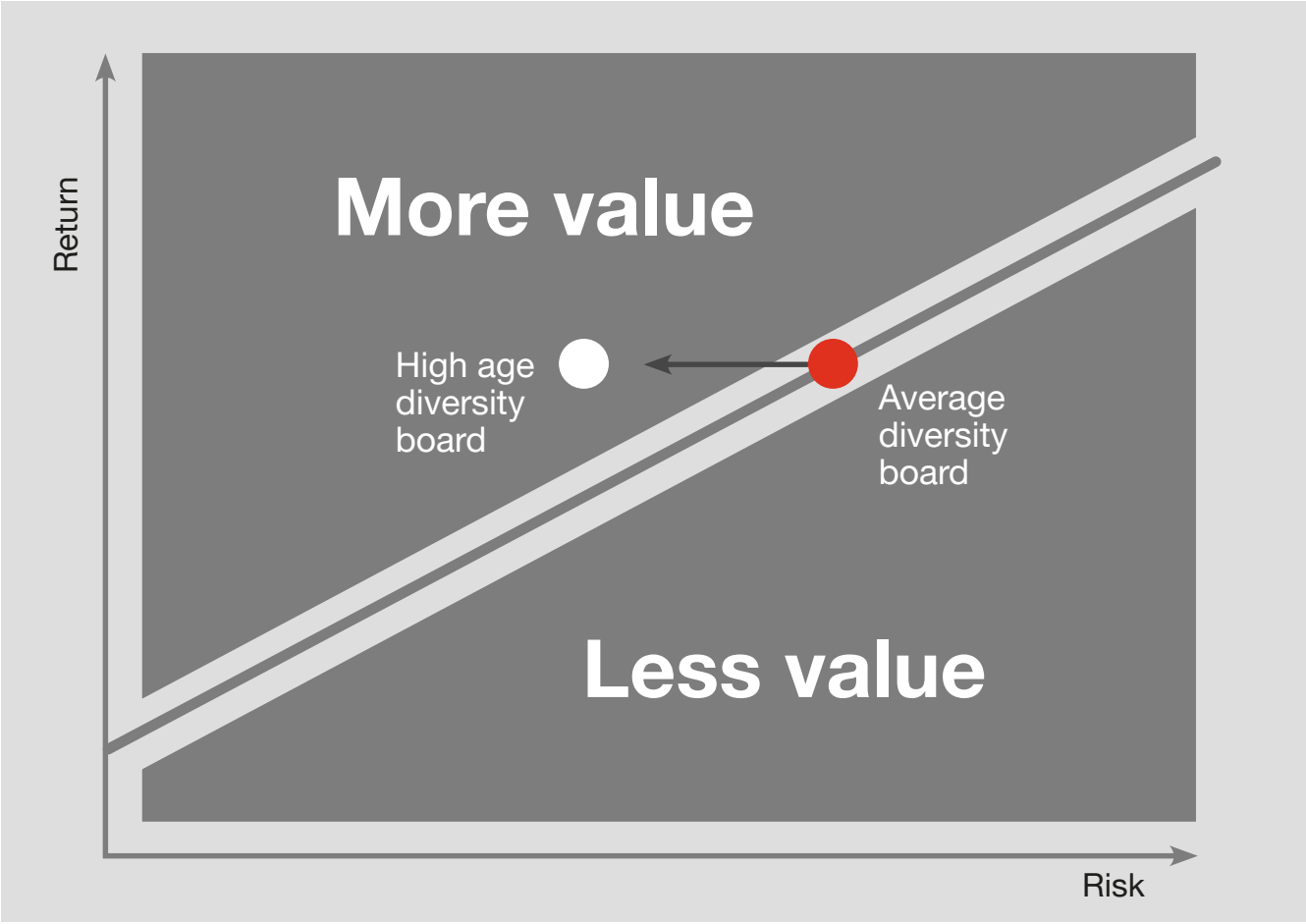
40 40 40 45 45 45 60 60 75 80 *Age diversity – 43*



From the industries represented in our sample, only in energy, utility and resources and in entertainment and media more than 10% of companies in the Netherlands are in the optimal board age diversity range. Considering our whole dataset, it becomes apparent that boards in the telecom industry most prominently lack age diversity – a finding in line with a 2018 PwC report on the age composition of S&P 500 boards.[19,20]

The implications for company risk-return trade-off

Solvency ratio is a reasonably close proxy for the combined risk appetite of board members. It is related to the long-term financial well-being of a company. A low solvency ratio indicates that a company might have issues paying for its financial obligations in the long-run.



A higher solvency ratio can protect a company in times of crisis, as it indicates a better ability to withstand unexpected shocks without increasing dependence on external financing. It also indicates a smaller risk for financiers. This can be particularly important in a context of higher interest rates, as financiers can offer lower rates when they perceive a smaller risk.

Our econometric results then indicate that increasing age diversity up to an optimal level is related to higher solvency and, consequently, to less risk. Increasing age diversity leads to less risk without affecting returns, which represents an increase in value.

What does this mean for the Dutch economy?

We estimate that if Dutch companies in our sample reached the optimal board age diversity level, it would add up to €51.8bn in added value, or 1.8% of their current book value[21]. We extend our estimates of improving book value in terms of the domestic market capitalization of Euronext Amsterdam[22] (€1.2tn, November 2022). In that case, the potential gain would be equivalent to €21.7bn. That would correspond to a company with a similar market cap to DSM (c. €21.9bn), for example, being added to Euronext Amsterdam.

Why improving age diversity is important

There is vast literature exploring the theoretical advantages and disadvantages of age diversity[23]. As the theoretical arguments highlight, if there is an optimum level of age diversity, then the benefits prevail, and age diversity in company boards can be a strategic advantage.

Companies that obtain the optimal level of age diversity would incorporate more generations on their boards. This would lead to a wider network of resources, stakeholder relations, scope of available skills, knowledge and know-how in comparison to a more homogenous board. Moreover, a wider representation in terms of age on a company's board could lead to a larger consumer and employee segment taken into account when making strategic decisions.

However, effective management is necessary for age-diverse boards to deal with potential communication, decision sluggishness and value alignment issues that might arise. If all board members are allowed to bring their unique selves to the table, their diversity from the rest of the group would create an unbeatable advantage[24], allowing to harness the full potential of benefits that are brought by age diversity.

Benefits

Age diversity can bring the best of all generations into discussions and decision-making

More age-diverse teams can tap into a wider network of resources

More age diversity can incorporate a larger consumer segment in strategic decisions

Age diversity can ensure a smooth transition and keep know-how 'in-house'

Role models and representation from different generations can inspire potential leaders to step-up and better tackle group-specific issues

Pitfalls

Different generations can have different attitudes towards remote work, styles of communication and hierarchy

Age-diverse teams can have communication and trust issues

Incentives of different generations can be in a misalignment

Potential benefits of age diversity in company boards

- **Decision-making can be more effective by combining different perspectives, know-how and skills**

If properly managed, age diversity on company boards could constitute 'the best of all worlds' as each generation can bring specific know-how and skills to the table[25,26]. One can think of the ideal board and workforce composition as an orchestra, with each generation playing a certain instrument that has a distinct tune but only by playing together a symphony can be created[27].

By bringing together a wider array of viewpoints, age-diverse teams can reduce groupthink[28]. That can be especially useful in times of more frequent and different kinds of crises[29], as well as business transformation challenges and opportunities, such as sustainability and digitalisation[30], as age-diverse boards are consistently associated with better corporate social responsibility-related outcomes[31].

By involving a larger range of viewpoints in discussions[32], age-diverse boards could lead to more effective strategic decision-making[33]. Furthermore, age diversity can bring an enhanced knowledge base and greater creativity in boardrooms as people with different backgrounds and experiences approach problems differently[34]. This can help companies escape the 'stormtrooper problem' – when everyone working on the problem thinks about it the same way[35].

For example, more experienced directors are valuable, as their expertise, know-how and long careers can give them the benefit of having experienced several business cycles[36]. Moreover, they can be more reliable and committed to companies, compared to their younger counterparts .

However, the world and the business environment are also evolving. Companies' lifespans are becoming shorter[38]. Trends, such as climate change and the digital revolution are reshaping the modern workforce and society[39]. Younger directors may be more aware of those trends and contribute with more innovative and unconventional ideas[40]. In addition, they may be better suited to add value in necessary transformations, especially in areas such as finance, investing or technology[41].

- **More age-diverse teams can tap into a wider network of resources**

Board age diversity could also produce a more diverse set of board connections[42], resources[43] and expertise[44]. By appointing a set of age-diverse board members, the company can gain new linkages with a wider range of external resources and stakeholders that could benefit the growth and performance of the firm[45]. The overall level of human capital available to the team then can be increased with more age-diverse teams[46] that can represent a larger set of stakeholders.

- **More age diversity can incorporate a larger consumer segment in strategic decisions**

More than half of the world's population is under the age of thirty[47]. Younger people are exceedingly representing a larger share of society and consumers, and their spending habits differ from previous generations[48].

They are more keen to consume digitally[49], and 86 percent of Millennials use social media[50], which is more than other generations. In addition, Millennials and Generation Z are generally tech-savvy as they have used it extensively since birth to search for information, solve problems, relate to others and communicate[51]. Moreover, especially for Millennials, sustainability is a more important issue than for other generations[52].

It is not a given, however, that only board members from the same generation would understand the corresponding consumer groups. Nevertheless, it certainly would make it more likely that these groups are recognized and taken into account in strategic decisions[53].

- **Age diversity can ensure a smooth succession of boards and keep know-how 'in-house'**

Age diversity can allow for more gradual leadership changes, consequently reducing the loss in experience or knowledge because of that. Older leaders need opportunities and infrastructure to pass on both soft

skills and technical knowledge. Knowledge-sharing programs to retain such tacit knowledge can minimise disruptions when a long-standing leader of a company retires or steps down.

This can also expand the pool of future leaders, while simultaneously elevating leaders across multiple generations and increasing teamwork and collaboration across generations[54]. In addition, bringing younger leaders on a supervisory board level can allow them to apply their unique perspective on the challenges of the company, as well as acquire valuable skills on managing boardroom dynamics that can be helpful later on in their careers[55].

- **Role models and representations from different generations can be inspirational**

Age-diverse work environment and leadership empowers those of all generations and provides valuable representation for different groups. Younger leaders can better represent younger groups of workers and their issues as they relate to their concerns more effectively[56]. It also would strengthen the connection of older employees, who are more likely to face age-related discrimination – nearly eighty percent having seen or experienced age discrimination in the workplace[57]. Having older board members might make it more possible to deal with such problems in the workplace. A diverse representation on the board level can also help in attracting diverse groups of talent[58] and help with retention of key generational groups[59].

Potential pitfalls of age diversity in company boards

- **Different generations might lack understanding and cohesion**

Different characteristics and preferences between younger and older board members might lead to communication problems, conflicting viewpoints or disrupted team performance, harming the overall decision-making process[60]. Different age groups can have different attitudes towards remote work, styles of communication and hierarchy, for example.

Conflicts in the workplace often arise because of a lack of understanding between generations[61]. This is a worldwide phenomenon as advances in health and longevity are allowing older generations to stay in workplaces longer, while younger colleagues, anxious for change and upward mobility, are impatient to take their place. On the company board level, issues can arise with different views on information sharing and management styles as younger generations might be more comfortable with less vertical communication and more remote work.

- **Age-diverse teams can have trust issues and create divisions within teams**

A lack of trust between older and younger board members can bring increased competition and resentment. This can hurt team performance by limiting collaborations, sparking emotional conflict, leading to higher employee turnover and loss of productivity[62].

This corresponds to the similarity-attraction theory, which states that individuals are more attracted and have better social cohesion with individuals who are similar to themselves. This could mean that younger and older board members split in differing factions[63]. Such self-categorization could then create in-group/out-group tensions, for example, with older board members seeing the younger ones as out-group members[64]. Hence, age diversity could then diminish group cohesion, decision-making and performance[65].

- **Incentives of different generations towards risk can be misaligned**

Because of the stage in which workers are in their careers, different incentives and attitudes toward risk can come into play. For example, older directors might also be more willing to maintain stability and the status quo[66]. Research has shown that older individuals' risk tolerance[67,68] and risk-taking[69] declines with age. A study on the S&P 1500 also showed that firms led by older executives are less likely to engage in mergers, joint ventures or strategic alliances, divestitures and capital restructurings[70]. Research has also documented that older CEOs are making less risky investments, specifically in research and development (R&D), making more diversifying acquisitions and maintaining lower operating leverage[71]. Lastly, they might not be as energetic and might value time with family more[72].

Conclusion

Good executive and supervisory boards are important for company performance. It is important, therefore, to incorporate the right combination of people to get the most out of their collective strengths. However, it is not an easy task if the pool of potential board members is increasingly kept small, and there is not much innovation in board compositions.

Older directors have the benefit of decades of work experience. They may also have decades of board experience to bring to bear. But boards that are missing younger voices are also likely missing important perspectives in the room that might raise the entire board's game.

Cognitive diversity is important to allow for different approaches and solutions to a problem and to avoid blindspots. Incorporating age diversity, without neglecting other diversity dimensions, in company boards can be an important aspect to gain more cognitive diversity in decision making.

This paper shows that actively pursuing age diversity in boardrooms reduces the risk of a company, at given profitability levels. A consequence of the finding is that age diversity adds value. It, therefore, makes sense to start the conversation about the age component in boardroom selection.

Appendices

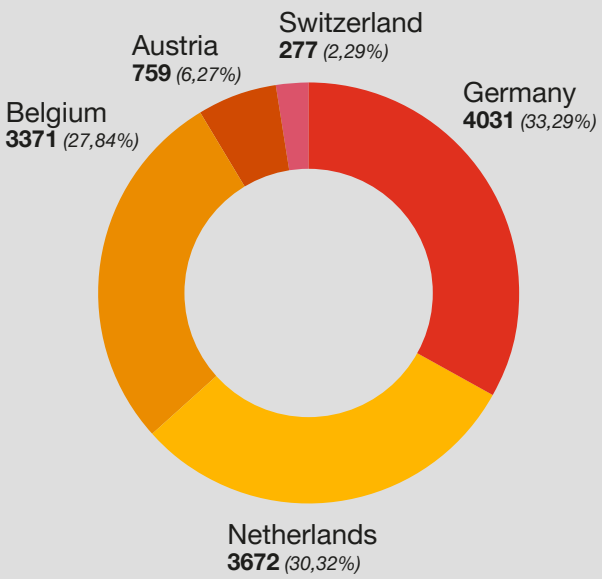
Appendix 1 - Methodology and technicalities

What is the data?

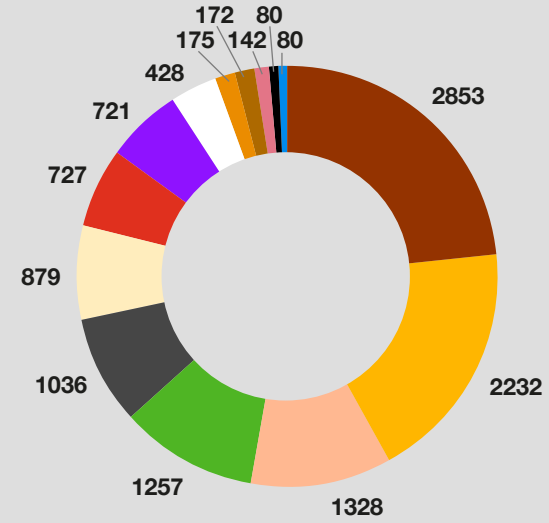
Our data includes companies from the Orbis database, which incorporates a large array of company financial and board demographic variables. Our sample consists of 11,558 companies in five countries – the Netherlands, Belgium, Germany, Austria and Switzerland. We exclude micro enterprises, and we look at companies that have more than ten employees and €2m in revenue. In addition, we also keep out companies that have only one board member as then there is no board diversity by definition.

The images below show the data distribution by country and industry: we define and aggregate the industries according to their NACE codes and our sample incorporates a wide range of industries.

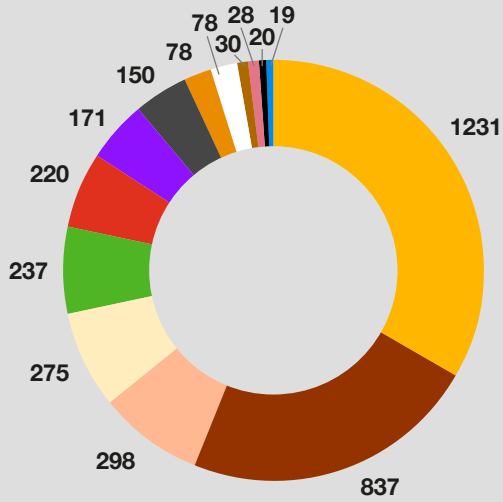
Number of companies by country

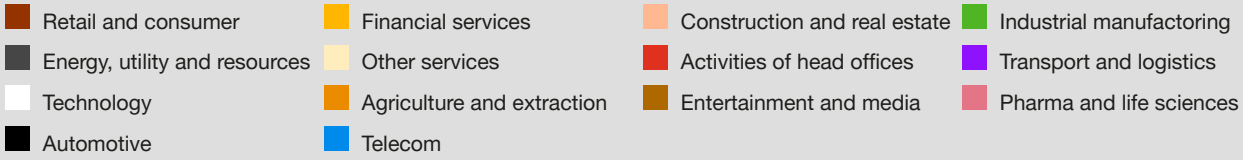


Number of companies by industry

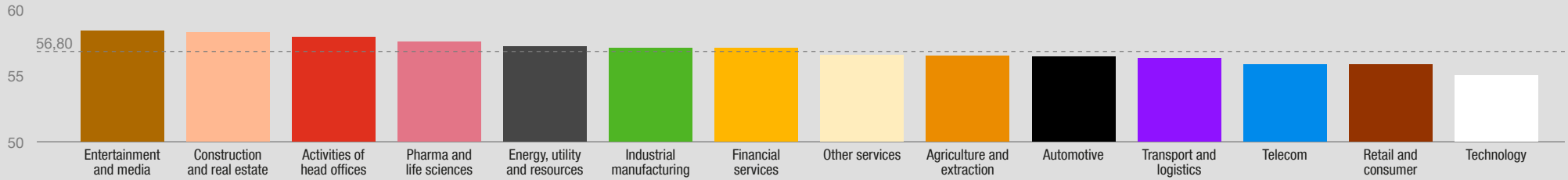


Number of companies by industry in the Netherlands

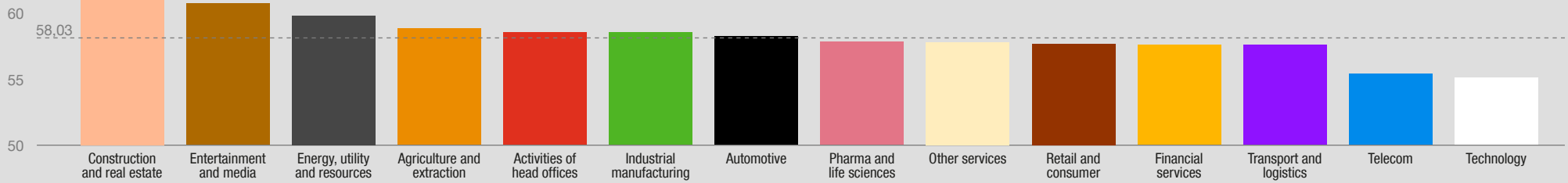




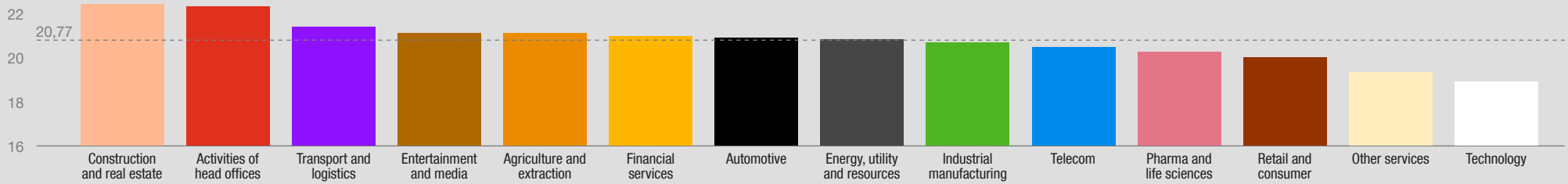
Average board age per industry



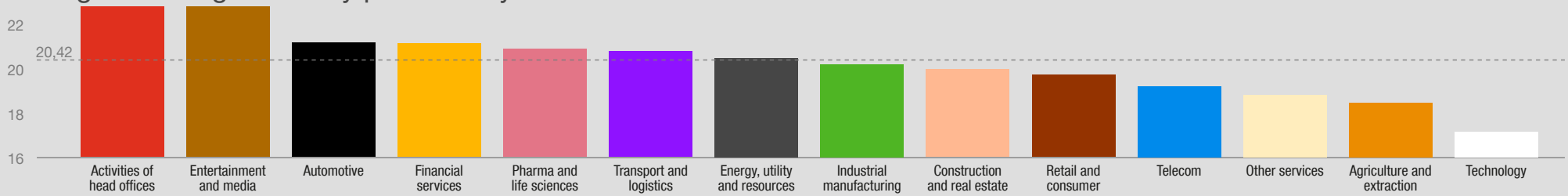
Average board age per industry in the Netherlands



Average board age diversity per industry



Average board age diversity per industry in the Netherlands



What is our model?

Our main regression model can be summarised as this:

$$Solvency\ Ratio = \beta_0 + \beta_1.Age\ Diversity + \beta_2.Age\ diversity^2 + \boldsymbol{X.\beta}$$

Where β_0 is a constant, β_1 and β_2 are the linear and non-linear age diversity effect coefficients, respectively. Solvency ratio is the main dependent variable and age diversity is the main independent variable.

We also include the matrix **Xß**. It incorporates the main control variables that we use: total assets, number of employees, company board size, company age, earnings and industry. These control variables ensure that the change in solvency ratio is not driven by something other than age diversity, and that we are comparing similar companies in their characteristics.

Additionally, as is accustomed in econometric studies, to improve both the coefficient understanding and to minimise the distortions that might arise with different distributions in the variables, we applied logarithmic transformation to the variables where possible. In our case, that meant including the logarithmic versions of the number of employees, company age, total assets and board size in our regression model.

How do we define the most important variables that we use?

Our main findings revolve around the relationship between age diversity and solvency ratio. But what are these two variables?

In technical terms, the age diversity indicator is the ratio of the standard deviation of the company board age to the average age of the company board. This is also called the coefficient of variation: σ/μ.

Originally, in our data this ratio spanned the range from 0 to 0.68. We shifted this range to be from 0 to 100 and transformed each company's age diversity value accordingly. This does not change anything in the statistical relationships in our data. But it makes it simpler and easier to understand the age diversity indicator as a variable on its own.

Solvency ratio can be defined in different ways. In this research we calculate it as the ratio between shareholder equity and total assets:
*(Shareholder equity/Total assets)*100*

The control variables that we include are defined as follows:

- **Number of employees** - the number of employees registered at the company, according to the Orbis database.
- **Company age** - age from the company registration date, according to the Orbis database, until 2022.
- **Total assets** - total assets as reported in the Orbis database.
- **Board size** - number of company board members (executive and non-executive).
- **Earnings** - profit or loss before taxes (PBT) as reported in the Orbis database.
- **Industry sector** - economic sector (primary, secondary or tertiary) to which the company's main activity belongs.

As a second step, we extend our regressions to the value of companies. That adds another variable, the book value, to the centre of our story. In accounting terms, book value is the difference in value between total assets and total liabilities. We redefine it in terms of solvency ratio as shown in the box below:

$$\frac{Solvency\ Ratio}{100} = \frac{Shareholder\ Equity}{Total\ Assets} = \frac{Total\ Assets - Total\ Liabilities}{Total\ Assets} = 1 - \frac{Total\ Liabilities}{Total\ Assets}$$

$$\frac{Solvency\ Ratio}{100} - 1 = -\frac{Total\ Liabilities}{Total\ Assets}$$

$$1 - \frac{Solvency\ Ratio}{100} = \frac{Total\ Liabilities}{Total\ Assets}$$

$$Total\ Liabilities = Total\ Assets\left(1 - \frac{Solvency\ Ratio}{100}\right)$$

$$Book\ value = Total\ Assets - Total\ Assets\left(1 - \frac{Solvency\ Ratio}{100}\right) = Total\ Assets\left(1 - 1 + \frac{Solvency\ Ratio}{100}\right) = Total\ Assets * \frac{Solvency\ Ratio}{100}$$

What did we find?

Firstly, we identified a positive and statistically significant[73] linear[74] and a negative statistically significant non-linear[75] relationship between age diversity on boards and solvency ratio.

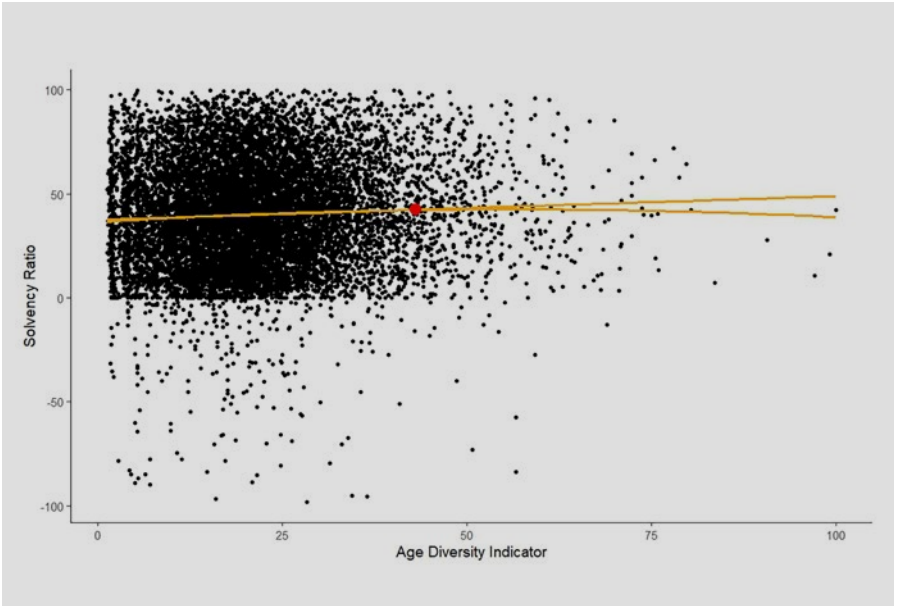
The linear coefficient of 0.25 implies that on average, controlling for the aforementioned variables, each percentage point increase in age diversity coefficient leads to up to 0.25 percentage point gain in solvency ratio. However, this effect diminishes as companies are closer to the optimum level of age diversity.

Furthermore, the R^2 value[76] in our results might seem low. In the case of solvency ratio, it shows that there might be many other variables that explain the variation, not just age diversity and the other variables used in the regression. To sum up, that means that the estimates are statistically significant but there might be other factors that also impact solvency ratio.

Secondly, due to the non-linear nature of our results, we also identified an optimum point of age diversity. We calculated it according to an optimization formula that is used to calculate the maximum/minimum of a function for a given variable. It is taking the derivative of a function with respect to a variable and setting it to zero. By using the coefficient estimates and applying the maximisation formula, we obtained the optimum to be at 43, as can be seen in the graph below, with the red dot indicating the optimum.

	Solvency Ratio
Age Diversity	0.251 ***
	(0.0614)
Age Diversity Squared	-0.00283 **
	(0.00104)
Log Number of Employees	-2.08 ***
	(0.189)
Log Company Age	2.45 ***
	(0.321)
Log Company Size(Assets)	0.0127
	(0.182)
Log Board Size	1.01 *
	(0.404)
Earnings	1.45e-06 *
	(6.22e-07)
Primary	12.3 ***
	(1.8)
Manufacturing	5.62 ***
	(0.585)
Constant	36.1 ***
	(1.87)
N	11569
R2	0.0364

Standard errors are heteroskedasticity robust.
*** p < 0.001; ** p < 0.01; * p < 0.05.



Calculation of value creation

To estimate how much value is created by improving age diversity, the first step is to calculate what the gain in solvency ratio would be.

1) This can be done by plugging in the difference between optimal age diversity and initial age diversity in the equation:

$$0.251 * x - 0.00283 * x^2$$

For example, in the case of a company with an age diversity of 33, the distance to optimal age diversity is 10 and the gain in solvency would be approximately 2.23%:

$$0.251 * 10 - 0.00283 * 10^2 = 2.51 - 0.283 = 2.227$$

2) The next step is to translate this gain solvency ratio into the change in value. This is the difference between the estimated new book value (at the optimal level of age diversity) and the old book value (at the original level of diversity):

$$Book\ Value_{new} - Book\ Value_{old} = Assets \times (Solvency_{new} - Solvency_{old}) = Assets \times \Delta Solvency$$

Assuming our example company has €5m in assets, that would result in a gain in book value of:

$$Assets \times \Delta Solvency = €5m \times 2.227\% = €111{,}350$$

This can also be estimated as a percentage of the original value

$$\frac{(Assets \times \Delta Solvency)}{Book\ Value_{old}} \times 100\% = \frac{\Delta Solvency}{Solvency_{old}} \times 100\%$$

Assuming that in the example company original solvency ratio was 30%:

$$\frac{\Delta Solvency}{Solvency_{old}} \times 100\% = \frac{2.227}{30} = 7.42\%$$

We also apply the methodology above using the averages of our sample, so that we estimate what is the gain in solvency ratio that our sample can obtain by improving age diversity to the optimal level.

3) We then calculate the book value the sample would have with the new estimated solvency ratio and compare it to the original book value. By doing this, we estimate that companies in our sample would collectively gain 1.77% in value by improving age diversity from the current level to the optimal one.

	Age diversity	Book value	Difference	Percentage gain
Sample average	28	€ 2,935,122,380,695	-	-
Optimal lower bound	36.5	€ 2,975,767,090,727	€ 40,644,710,032	1.38%
Optimal	43	€ 2,986,964,360,267	€ 51,841,979,572	1.77%
Optimal upper bound	49.5	€ 2.978.480.304.616	€ 43,357,923,921	1.48%

Are our results robust?

To check whether our obtained statistical relationships stand, we also performed several robustness tests. We tested whether the assumptions of a linear regression are met and the error structure of the variables.

Furthermore, we tried to use different forms of some variables and obtained corresponding results. We used standard deviation of age as an alternative measure for coefficient of variation. In addition, for solvency ratio, we also used book value and liabilities as alternative dependent variables found comparable statistically significant coefficients and a similar optimum level of age diversity. Other financial variables that were available in the data were also used but we did not find meaningful relationships.

Both academic and business literature has focused much more on other aspects of diversity, such as race and gender[77]. Even though this was not the focus of our study for robustness checks, we also looked at female ratio instead of age diversity in the board. By female ratio we mean the number of women divided by the total number of board members. We did not find a meaningful statistically significant relationship.

Information on other diversity indicators, such as nationality, ethnicity, cognitive and other diversity dimensions was not in the data.

Appendix 2 - Previous research on diversity

Existing studies on age diversity in company boards tend to focus on small samples of mostly public companies in selected countries[78]. In addition, there is no consistency if studies look at one or multiple countries, how age diversity is measured, if the samples are from one year or multiple years, cross-sectional or panel data, which financial performance variables are used and whether other diversity criteria with age are included[79].

- A study of a relatively small sample of European firms found that age diversity positively impacts company performance as measured by earnings before interest and taxes (EBIT)[80].
- A study on Vietnamese firms found no relation between the percentage of members under 45 years old and the performance of listed firms[81].
- Another study looking at only 76 companies across five years concluded that there is no significance of age diversity and company performance, although that might be because age diversity is low on the boards in the United Kingdom in general[82].
- Similarly, a study looking at only 45 Mauritius companies found no relationship between age diversity and company performance[83].
- A study, looking at 13 years of data on S&P 1500 companies found that age-diverse boards are associated with significantly less corporate misconduct – both in terms of the number of violations and fines paid[84].

Some studies have also looked at the average age of directors and boards.

- A study on Malaysian companies found an insignificant effect of directors' average age on return on assets but positive relation with share price[85].
- While a study[86], looking at 132 Australian listed companies, found that average age on board is positively associated with return on assets.
- A study on Canadian listed companies found that as average age increases company performance also tends to increase[87].
- On the other hand, a rigorous study on the S&P 1500, found that CEO age is negatively related to industry-adjusted return on assets, implying that while retaining an ageing CEO with accumulated firm-specific experience might be beneficial to company value, hiring an older outsider might be detrimental[88].

Lastly, Engelen et al. (2012) found no impact of nationality diversity on financial performance during crisis and Arioglu (2020) looked at the impact of culture and values on risk and firm performance.

Endnotes

1 HBR: Unlocking the Benefits of the Multigenerational Workplace (2020)
2 WEF: This is why boards of directors need younger members (2019)
3 In this research we include both executive and non-executive boards in our definition of company boards.
4 CEIC: Netherlands Market Capitalization: Euronext Amsterdam: Monthly
5 Yahoo Finance: Koninklijke DSM N.V. (DSM.AS)
6 PwC: Annual Corporate Directors Survey (2017)
7 Executive Finance: 42% van Nederlandse bedrijven heeft geen beleid op diversiteit en inclusiviteit (2021)
8 HBR: To Sustain DEI Momentum Companies Must Invest in 3 Areas (2022)
9 Spencer Stuart: US Board Index (2017)
10 FD: Jong geleerd is oud gedaan (2019)
11 Accountant.nl: De meerwaarde van een jonge commissaris (2018)
12 CBS and PwC analysis
13 Companyinfo data and PwC analysis
14 On Company.info, board composition data was available for 23 out of 25 companies.
15 We consider both supervisory and executive boards
16 Orbis: Company data
17 Ali et al: Board Age and Gender Diversity: A Test of Competing Linear and Curvilinear Predictions (2014)
18 Engelen et al.: Board Diversity as a Shield During the Financial Crisis (2012)
19 PwC: Board composition: Consider the value of younger directors on your board (2018)
20 It seems from our data that telecom boards are more homogenous in age. Even though the exact reasons are not straight forward, there are two possible hypotheses that could account for the discrepancy.
Firstly, according to a 2019 Spencer Stuart study, two-thirds of CEOs in telecommunications are within-firm appointees, and thus only a third of CEOs originate from positions outside of the parent firm. A similar situation might be present on boards more generally. The reason might be the high level of firm-level expertise and sector-specific knowledge required to fulfil an executive position in the industry. If this were to be true, it would significantly limit the number of younger employees able to hold an executive role, explaining the lack of age diversity.
A second hypothesis that could account for low telecom age diversity is the lack of family-ownership in the industry. Family-owned businesses usually incorporate multiple generations of the family in running the firm, boosting age diversity figures. In the telecom industry, however, the market is mainly controlled by a number of large, often publicly traded corporations.
21 Difference between total assets and liabilities.
22 CEIC: Netherlands Market Capitalization: Euronext Amsterdam: Monthly
23 Gardiner: What's age got to do with it? The effect of board member age diversity: a systematic review (2022)
24 HBR: Unlocking the Benefits of the Multigenerational Workplace (2020)
25 MM&K: The Importance of Age Diversity in the Boardroom – Research in AIM and FTSE 100 Listed Companies (2021)
26 Neukirchen et al.: Board Age Diversity and Corporate Misconduct (2022)
27 HBR: Unlocking the Benefits of the Multigenerational Workplace (2020)
28 Psychology Today: Groupthink - a phenomenon that occurs when a group of well-intentioned people makes irrational or non-optimal decisions spurred by the urge to conform or the belief that dissent is impossible.
29 WEF: Global Risk Report (2022)
30 van Essen et al: Does "Good" Corporate Governance Help in a Crisis? The Impact of Country- and Firm-Level Governance Mechanisms in the European Financial Crisis (2013)
31 Gardiner: What's age got to do with it? The effect of board member age diversity: a systematic review (2022)
32 Sitthipongpanich & Polsiri: Do CEO and board characteristics matter? A study of Thai family firms (2015)
33 Ali et al.: Board Age and Gender Diversity: A Test of Competing Linear and Curvilinear Predictions (2014)
34 Arioglu: Board age and value diversity: Evidence from a collectivistic and paternalistic culture (2021)
35 Farnam Street: The Stormtrooper Problem: Why Thought Diversity Makes Us Better (2022)
36 PwC: Consider the value of younger directors on your board (2018)
37 Sitthipongpanich & Polsiri: Do CEO and board characteristics matter? A study of Thai family firms (2015)
38 Forbes: Why Having Young People On Corporate Boards Is A Game-Changer (2020)
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51 HBR: Hitting The Intergenerational Sweet Spot (2013)
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57 CNBC: How older workers can push back against the reality of ageism (2022)
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64 Engelen et al.: Board Diversity as a Shield During the Financial Crisis (2012)
65 Gardiner: What’s age got to do with it? The effect of board member age diversity: a systematic review (2022)
66 Waelchli: Old captains at the helm: Chairman age and firm performance (2013)
67 Bucciol & Miniaci: Household Portfolios and Implicit Risk Preference (2011)
68 Grable et al.: Risk Tolerance Estimation Bias: The Age Effect (2009)
69 Berger et al.: Executive board composition and bank risk taking (2014)
70 Cline & Yore: Silverback CEOs: Age, experience, and firm value (2015)
71 Serfling: CEO age and the riskiness of corporate policies (2014)
72 Ng & Feldman: The relationship of age to ten dimensions of job performance (2008)
73 By statistically significant meaning that the results would be replicable in other data sets. A p-value indicates this likelihood and is represented by stars in the table. The lower the p-value, the higher the confidence in the results being statistically significant.
*** means that this probability is 99.9%, ** that it is 99% and * that it is 95%.
74 A linear relationship means that increasing or decreasing one variable x times will cause a consequent increase or decrease of x times in the other variable. It can also be said that the slope of the relationship is a constant straight line and follows y = mx+b.
75 A non-linear relationship means that instead of being constant, the relationship is a curve whose slope changes as the value of one of the variables changes.
76 It is the square of the correlation coefficient (describing how strong the association between two variables is) and can range from 0 to 1.
77 Gardiner: What’s age got to do with it? The effect of board member age diversity: a systematic review (2022)
78 Ibid.
79 Ibid.
80 Ferrero-Ferrero et al.: Age Diversity: An Empirical Study in the Board of Directors (2015)
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