# Europe's Digitalization and the EDIH initiative: What leads firms to participate?

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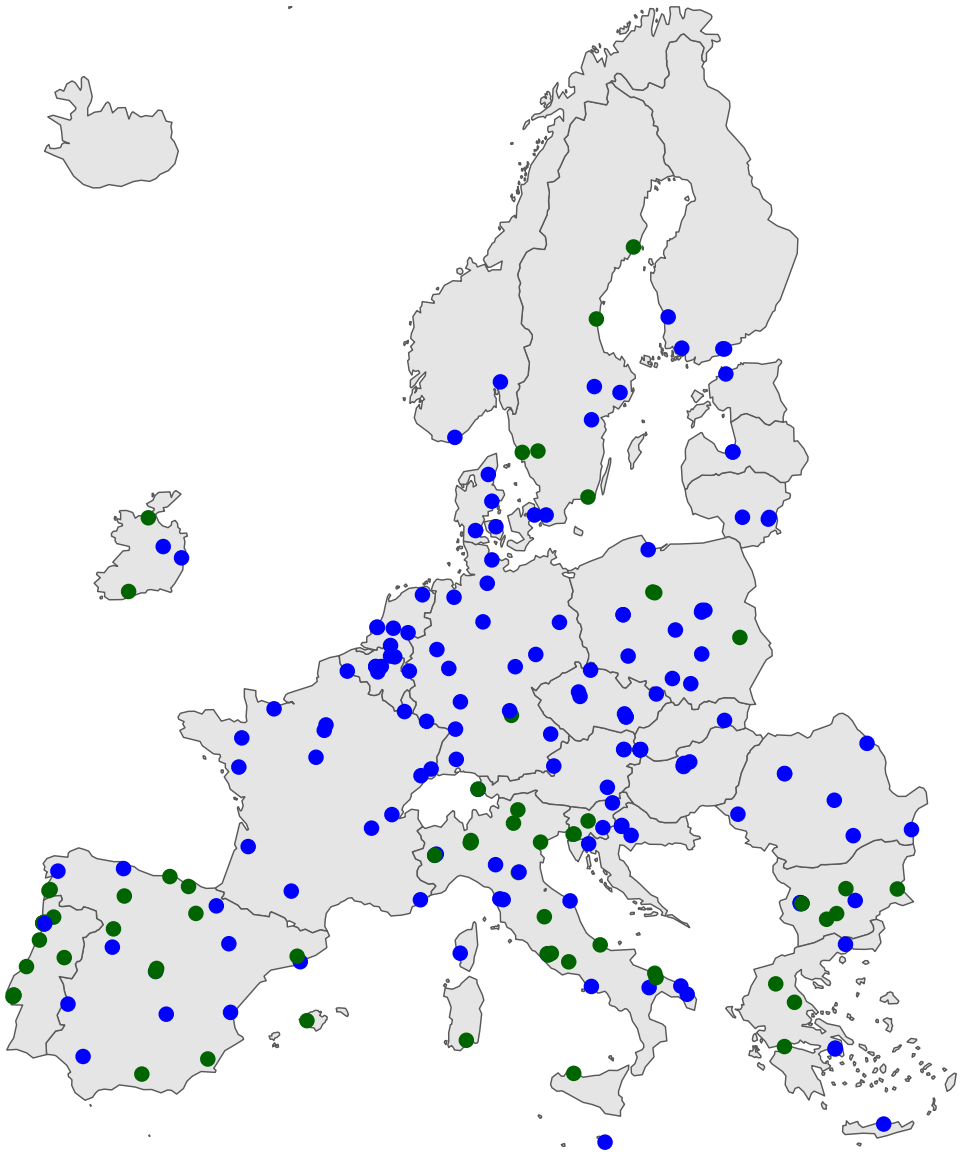
# Disclaimer

**Disclaimer:** The data used for the analysis performed is provided by the Joint Research Centre (JRC) of the European Commission. However, the opinions and interpretations expressed are solely my own and do not necessarily reflect the views of the JRC or the European Commission.

# Let's begin with some context

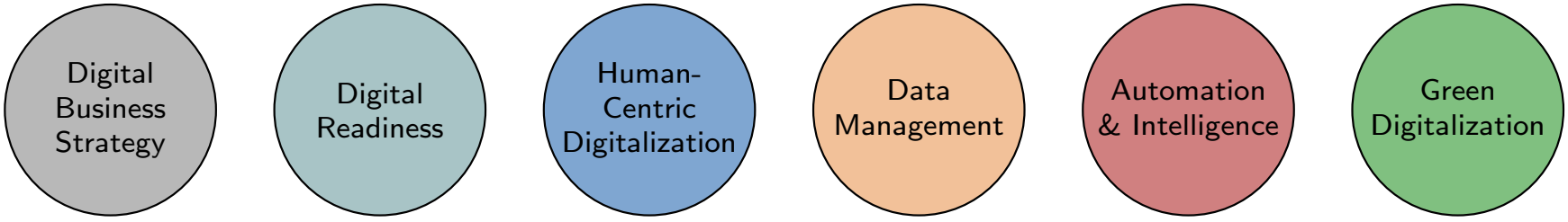
- Europe lags behind both the US and China in terms of digitalization [European Commission (2021) and Draghi (2024)]
- The European Commission in response launched the **Digital Innovation Hub (DIH)** initiative in 2016 $\rightarrow$ limited effect due to fragmented approach
- **Solution:** creation of the **European Digital Innovation Hubs (EDIHs)** network in 2021 $\rightarrow$ operational in late 2023
- **What are EDIHs?** One-stop shops that **help SMEs to access technology and knowledge**, providing support in digitalization and innovation processes
- Main improvement w.r.t DIHs: **European funding** and **network approach**.

# EDIH Network - The Map



# The DMA Survey - Design

- In 2021, European Commission tasks the Joint Research Centre (JRC) with the design of a survey to evaluate the success of the EDIH initiative
- Focus on the measure of Digital Maturity across six dimensions:




- Survey submitted by firms using the EDIH services at 3 points in time:

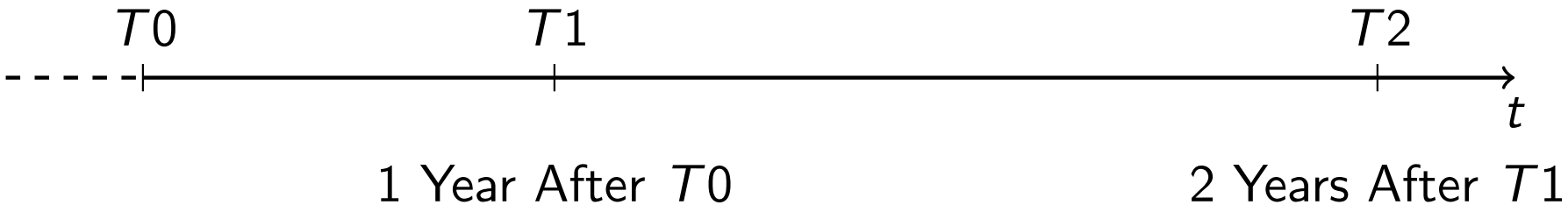



Figure: Timeline of DMA Submissions

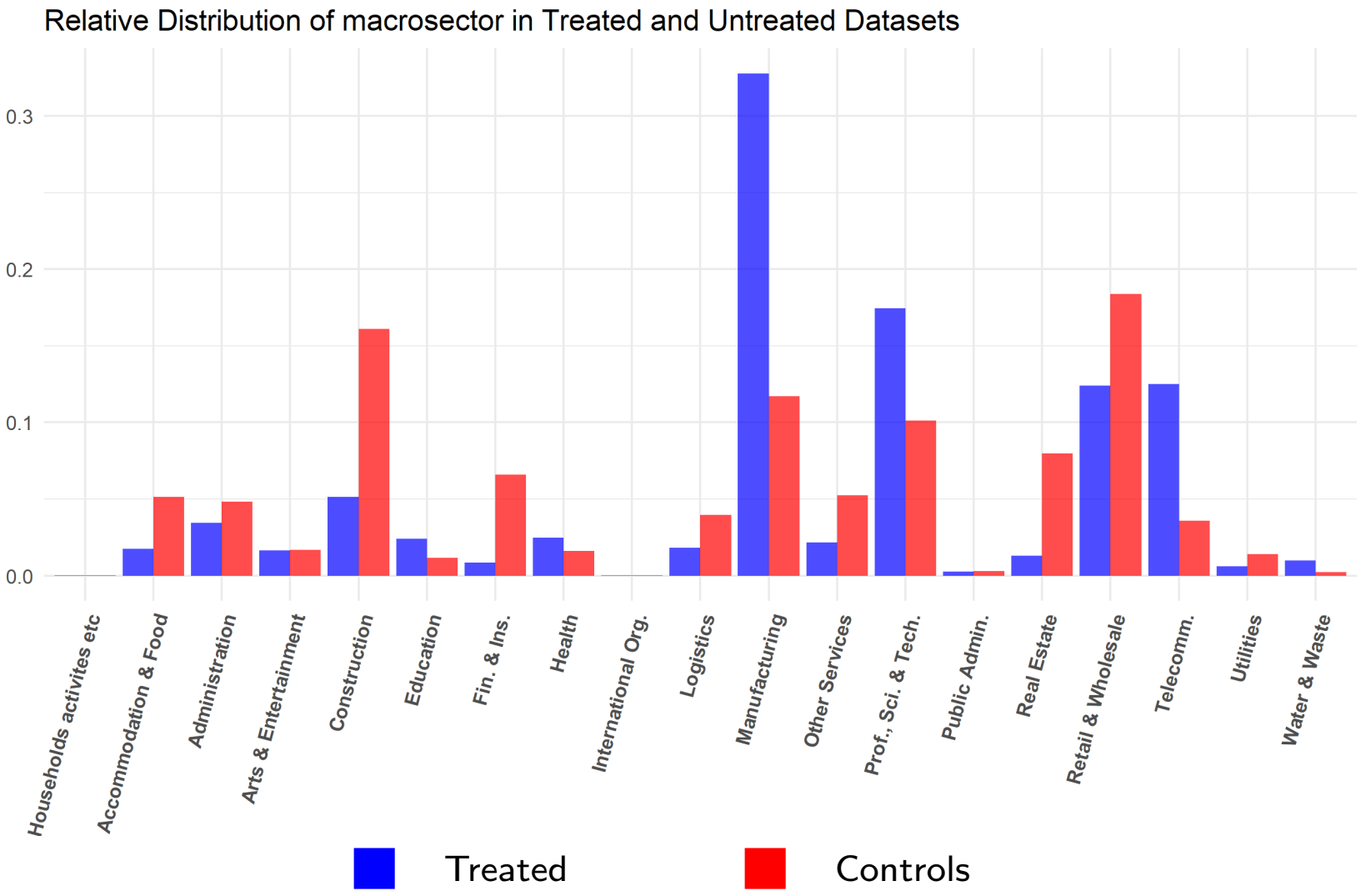
# The Research Question

- EDIHs started operating in late 2023 $\rightarrow$ we only have data for $T0$ and (a very limited number of) $T1$ obs.
- Research Question: **What leads firms to participate in the EDIH initiative?**
- Question is relevant w.r.t.:
  - **Revisions of the initiative**
  - **Future impact evaluation** (size of potential bias in the estimate).
- Hypothesis: drivers of participation are both **financial and non-financial factors** (including **geospatial characteristics**).

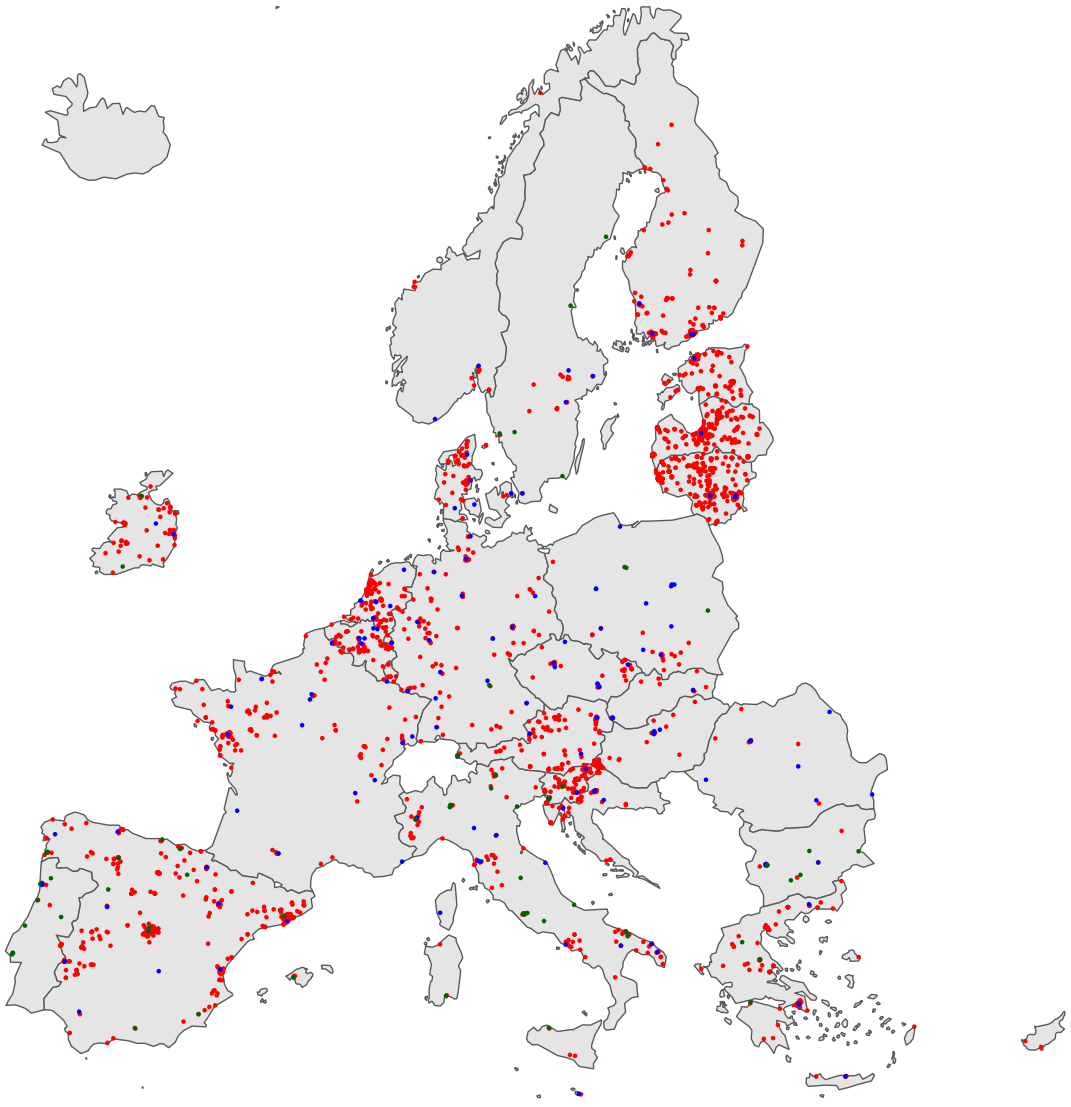
# Methodology - Construction of the sample

1. **Matching** of 3204 treated firms with ORBIS (using Jaro-Winkler distance) $\rightarrow$ 90% matched $\rightarrow$ **firm-level data for treated group**.
2. **Construction** of a **synthetic control group** of untreated firms randomly sampled from the ORBIS database $\rightarrow$ **firm-level data for control group**.
3. **Geocoding** of both treated and control groups:
   input address $\rightarrow$ output coordinates.
4. **Compute**
   - **Haversine distance** of each firm to the closest EDIH
   - **Firm Density** within 5 km radius of each firm (w/o EDIHs)
5. Final sample: **1249 treated** firms and **3643 controls**.

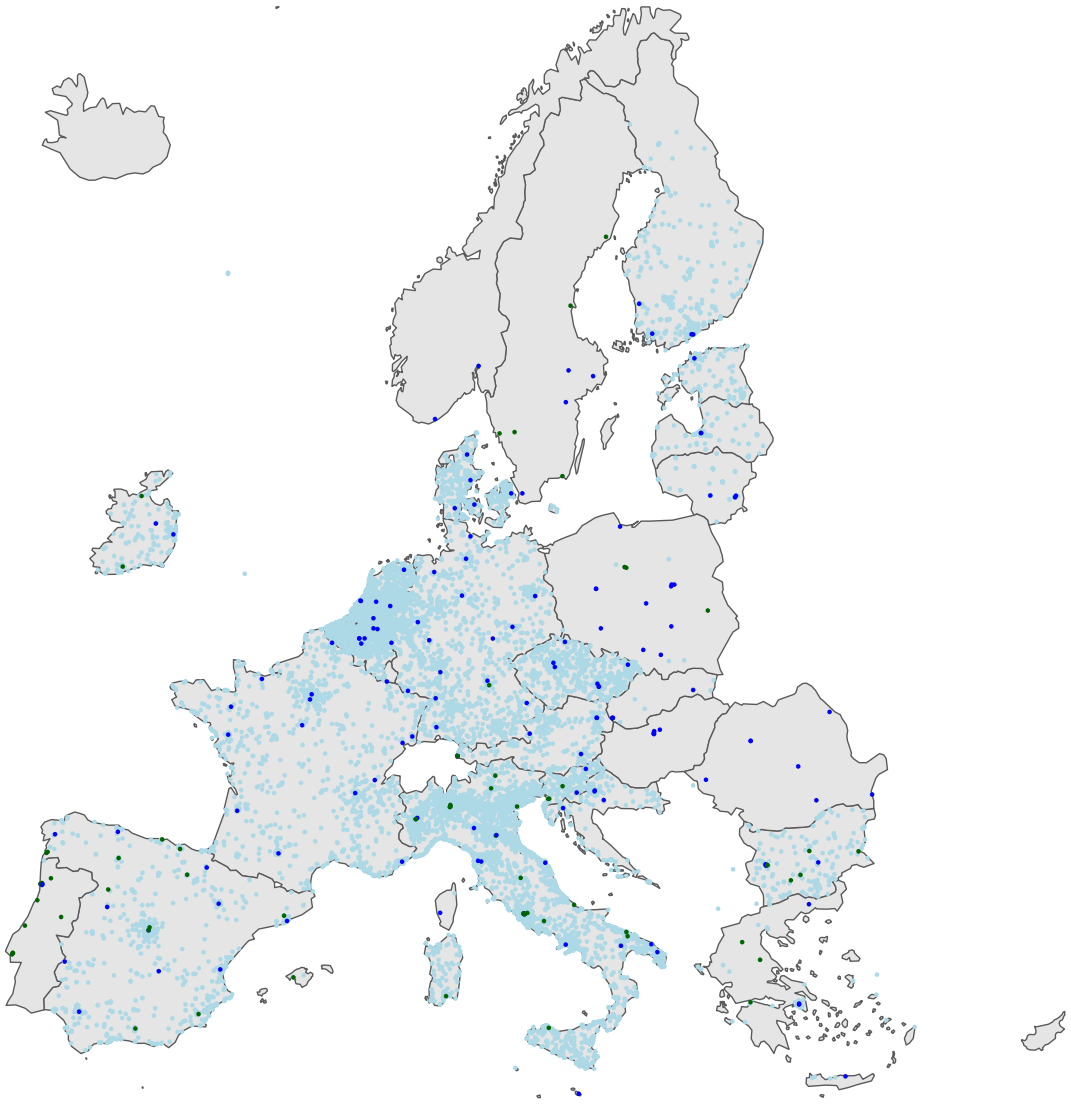
# Macrosectors compared: Treated vs Control



# Location compared: Treated...



# ...vs Control



# Methodology - Model Specification

- Estimate a Probit model with the following specification:

$$\begin{aligned} D_i(\text{Treated}_i = 1) = \beta_0 &+ \beta_1 \text{Distance}_i + \beta_2 \text{Firm Density}_i \\ &+ \beta_3 \text{Sector}_i + \beta_4 \text{Tech Level}_i \\ &+ \beta_5 \text{Turnover}_i + \beta_6 \text{Employees}_i \\ &+ \beta_7 \text{Liquidity Ratio}_i + \beta_8 \text{Solvency Ratio}_i \\ &+ \beta_9 \text{Country Group}_i + \varepsilon_i \end{aligned}$$

- Variations:
  - Model 1: Without distance and firm density.
  - Model 2: With distance and without firm density.
  - Model 3: With both firm density and distance (Model 3 is run on the whole sample and then on macrosectoral subsamples).

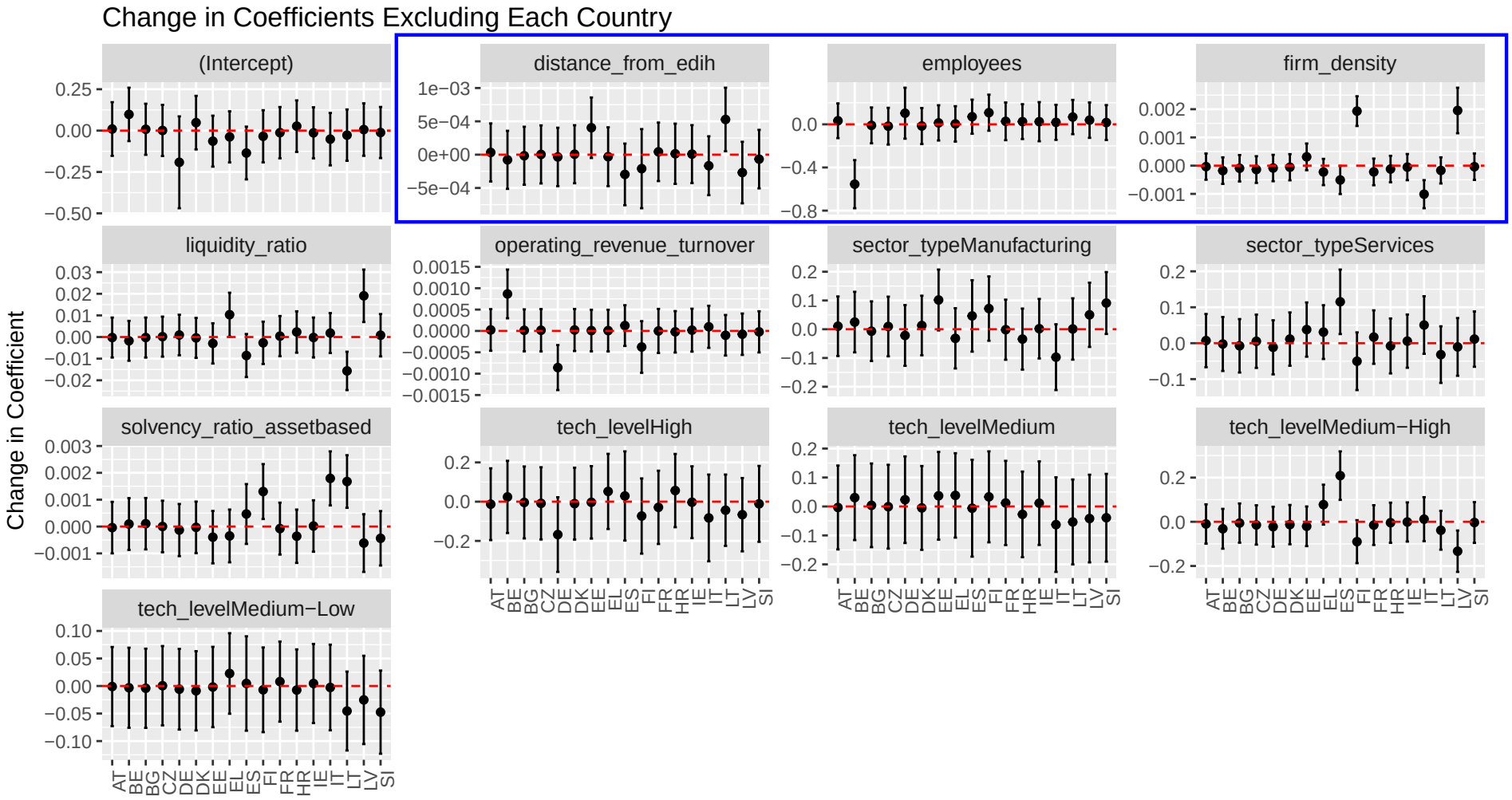
# Regression Results - Coefficients

| | treated | | |
|---|---|---|---|
| | w/o Dist | w/ Dist | w/ Dist and Dens |
| Dist. from EDIH | | −0.002*** | −0.002*** |
| | | (0.0004) | (0.0004) |
| Firm Density | | | 0.001*** |
| | | | (0.0005) |
| Manufacturing | 0.328*** | 0.337*** | 0.361*** |
| | (0.103) | (0.103) | (0.103) |
| Services | 0.269*** | 0.245*** | 0.222*** |
| | (0.074) | (0.074) | (0.074) |
| High Tech | 1.260*** | 1.233*** | 1.216*** |
| | (0.181) | (0.182) | (0.183) |
| Medium-High Tech | 1.592*** | 1.554*** | 1.539*** |
| | (0.088) | (0.089) | (0.089) |
| Medium Tech | 0.783*** | 0.766*** | 0.749*** |
| | (0.143) | (0.144) | (0.144) |
| Medium-Low Tech | 0.774*** | 0.745*** | 0.723*** |
| | (0.070) | (0.071) | (0.072) |
| Turnover | −0.0004 | −0.0004 | −0.0004 |
| | (0.0005) | (0.0005) | (0.0005) |
| Employees | 0.768*** | 0.749*** | 0.741*** |
| | (0.165) | (0.165) | (0.164) |
| Liquidity Ratio | −0.092*** | −0.094*** | −0.095*** |
| | (0.009) | (0.009) | (0.009) |
| Solvency Ratio | 0.010*** | 0.010*** | 0.010*** |
| | (0.001) | (0.001) | (0.001) |
| Observations | 4,864 | 4,864 | 4,864 |
| *Note:* | | | *p<0.1; **p<0.05; ***p<0.01 |

# Regression Results - Average Marginal Effects

| factor | AME | SE | p | lower | upper |
|---|---|---|---|---|---|
| Dist. from EDIH | -0.0003 | 0.0001 | 0.0003 | -0.0005 | -0.0001 |
| Employees | 0.143 | 0.032 | 0.00001 | 0.082 | 0.205 |
| Firm Density | 0.0003 | 0.0001 | 0.002 | 0.0001 | 0.0005 |
| Liquidity Ratio | -0.018 | 0.002 | 0 | -0.022 | -0.015 |
| Turnover | -0.0001 | 0.0001 | 0.450 | -0.0003 | 0.0001 |
| Manufacturing | 0.071 | 0.021 | 0.001 | 0.030 | 0.111 |
| Services | 0.042 | 0.014 | 0.002 | 0.015 | 0.069 |
| Solvency Ratio | 0.002 | 0.0002 | 0 | 0.002 | 0.002 |
| High Tech | 0.290 | 0.050 | 0 | 0.191 | 0.389 |
| Medium Tech | 0.164 | 0.036 | 0.00001 | 0.093 | 0.235 |
| Medium-High Tech | 0.380 | 0.023 | 0 | 0.334 | 0.426 |
| Medium-Low Tech | 0.157 | 0.017 | 0 | 0.124 | 0.191 |

# Robustness Check - Country Effects on coefficients



# Conclusions, Policy Implications & Future Research

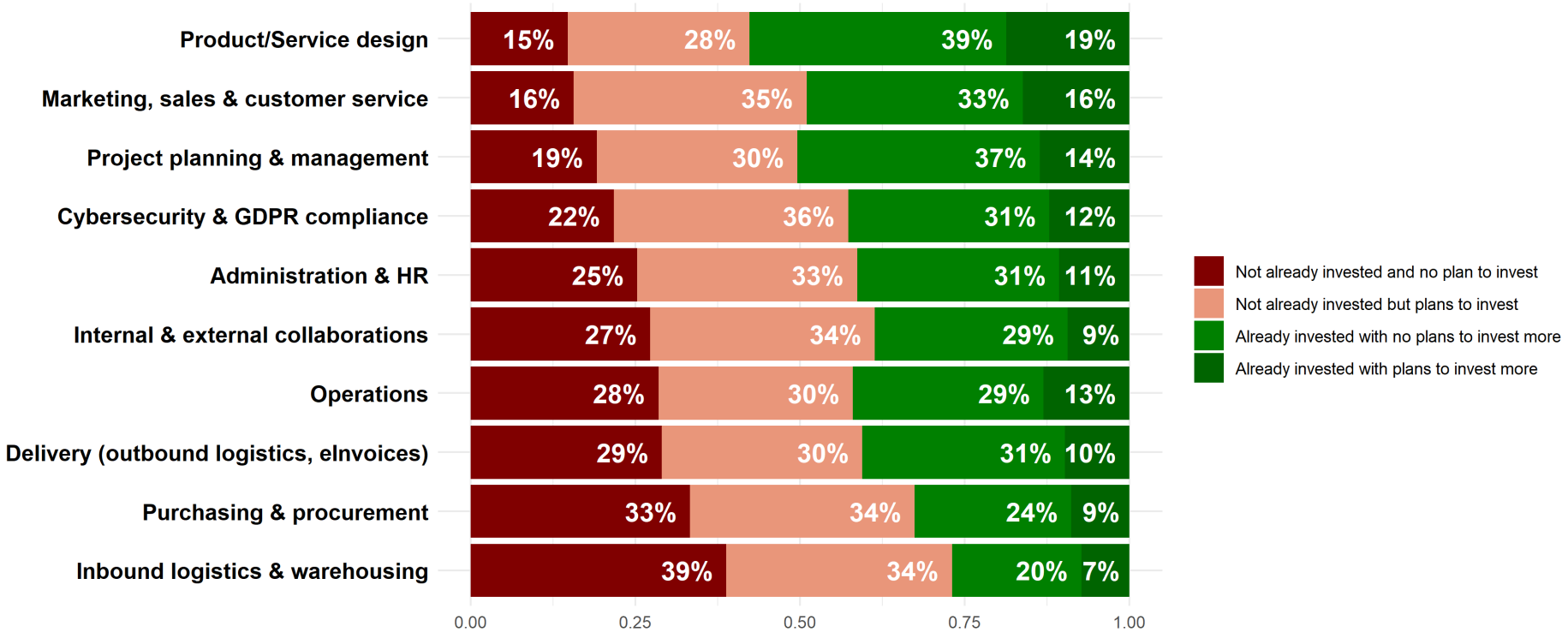
- Geospatial characteristics are drivers of participation in the EDIH initiative $\rightarrow$ **geographical distribution of EDIHs is key!**
- **Positive effect** of **size** and **solvency ratio** & **negative** effect of **liquidity ratio** $\rightarrow$ **larger**, financially **stable** (but **liquidity-constrained!**) firms are **more likely to participate** $\rightarrow$ **correct targeting?**
- Country effects are significant $\rightarrow$ **EDIH's internal know-how is relevant!** $\rightarrow$ effect should taper down over time.
- Future work: **Impact evaluation** of the EDIH initiative on firm-level outcomes; **EDIH-level analysis** on effectiveness of the network approach.

# The End

**Thanks for Your Attention!**

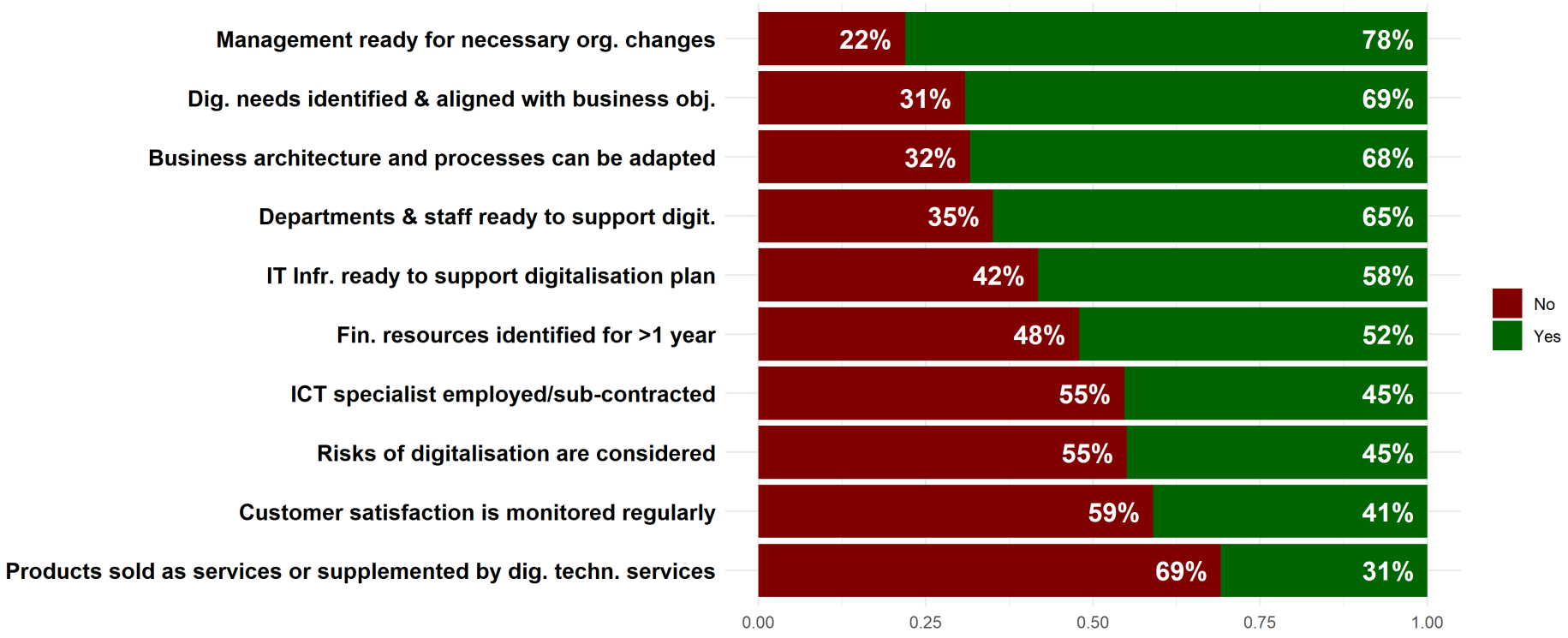
# DMA - Question 1

*In which of the following business areas has your enterprise already invested in digitalisation and in which ones does it plan to in the future?*



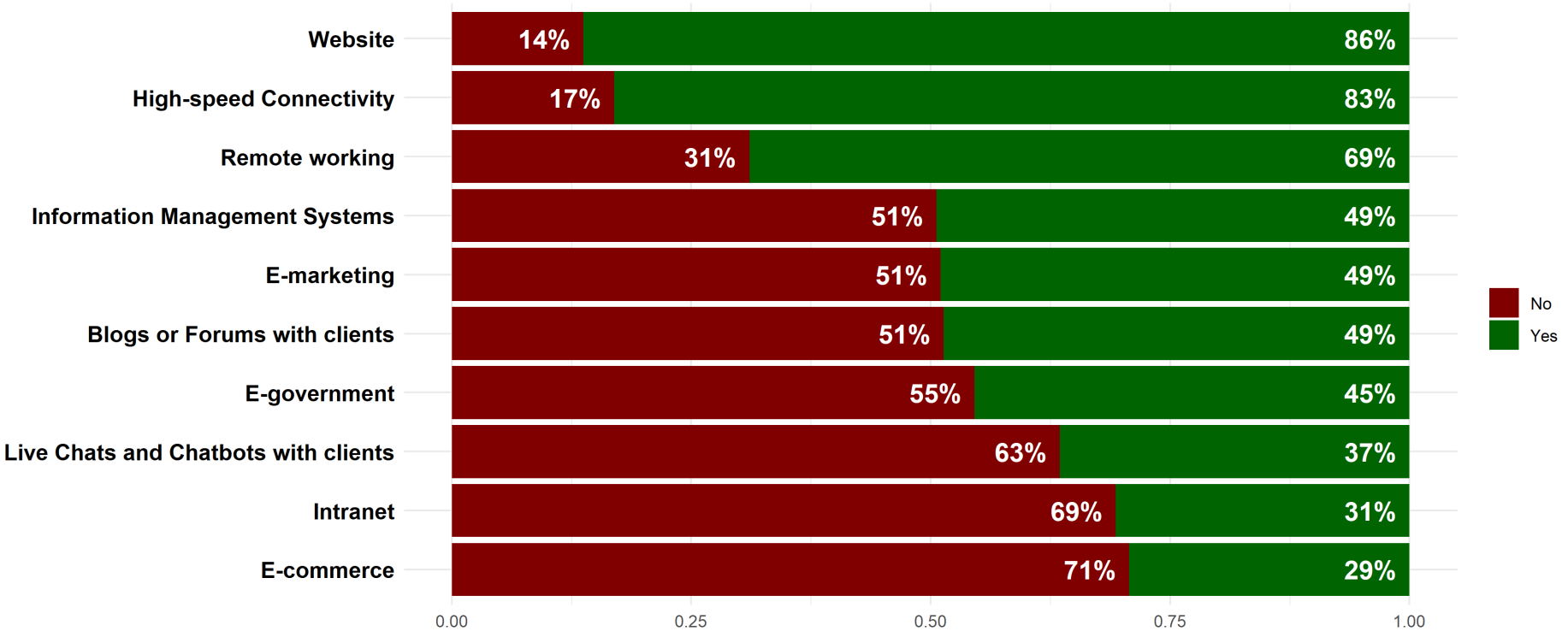
# DMA - Question 2

*In which of the following ways is your enterprise prepared for (more) digitalisation?*



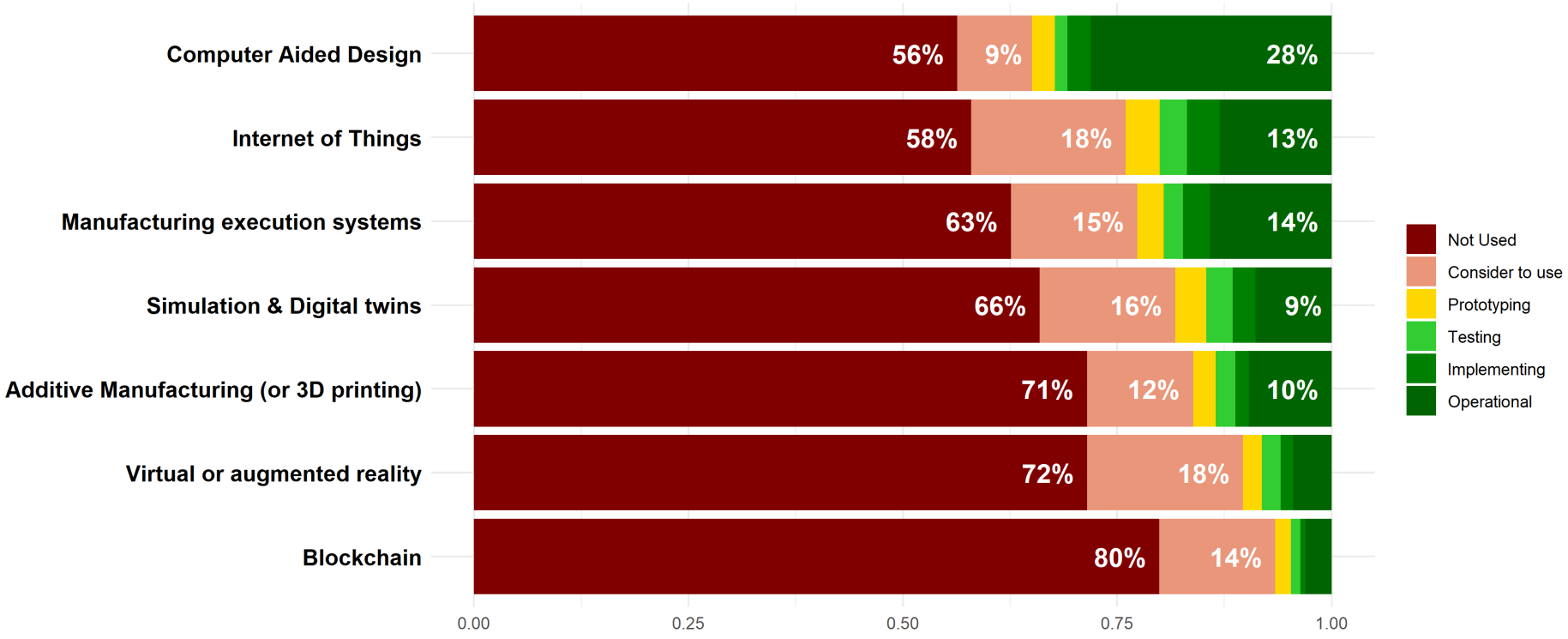
# DMA - Question 3

*Which of the following digital technologies and solutions are already used by your enterprise?*



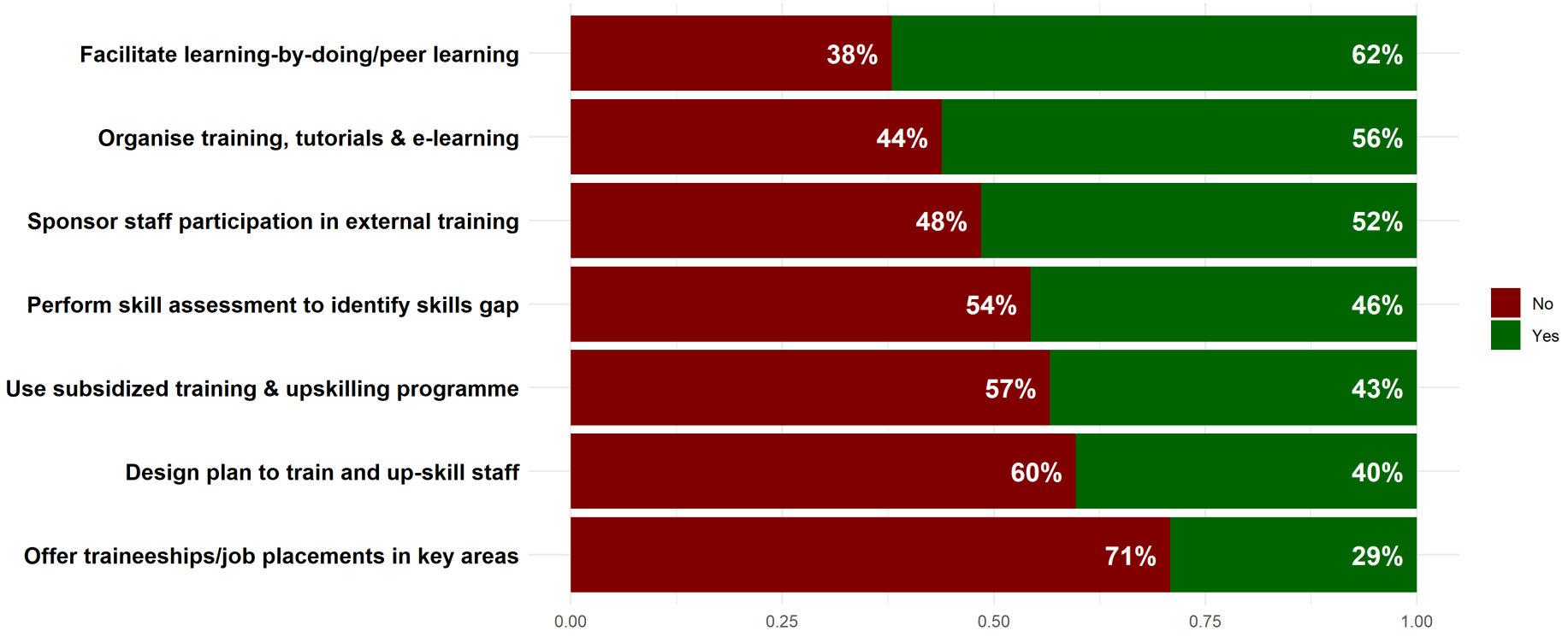
# DMA - Question 4

*Which of the following advanced digital technologies are already used by your enterprise?*



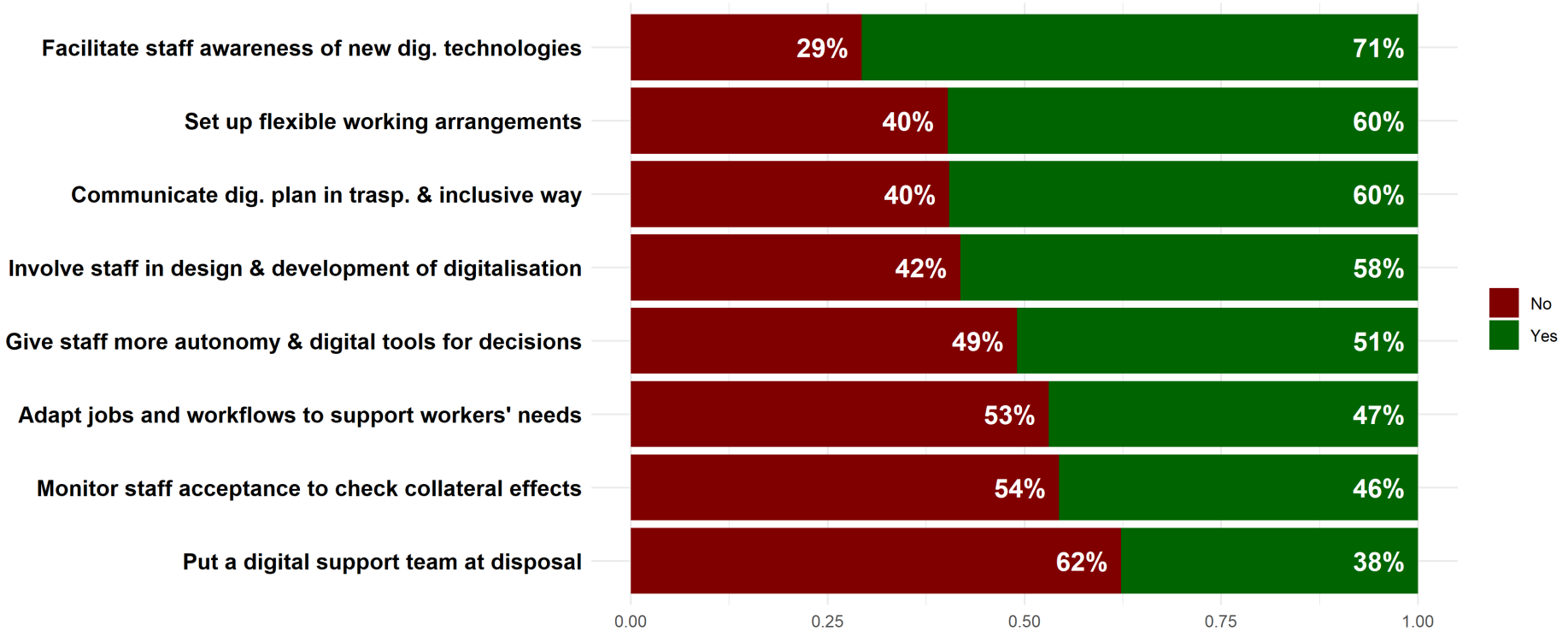
# DMA - Question 5

*What does your enterprise do to re-skill and up-skill its staff for digitalisation?*



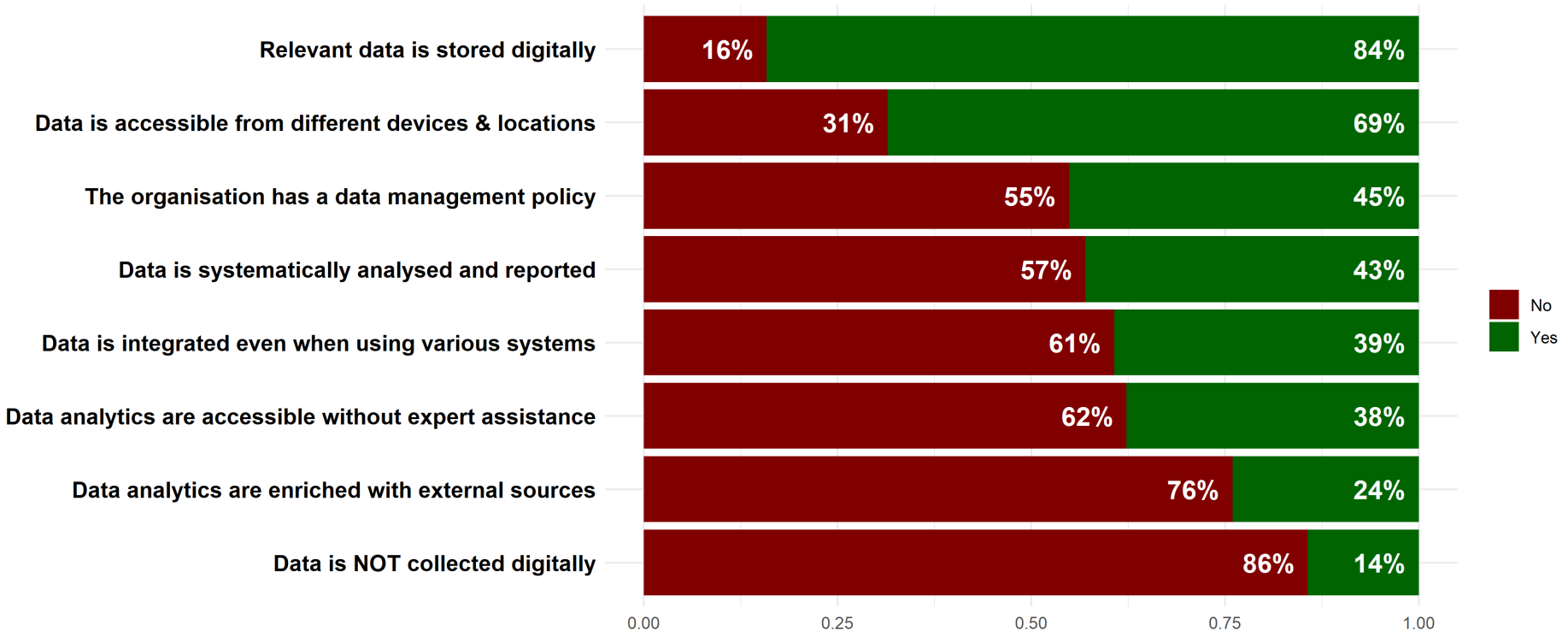
# DMA - Question 6

*When adopting new digital solutions, how does your enterprise engage and empower its staff?*



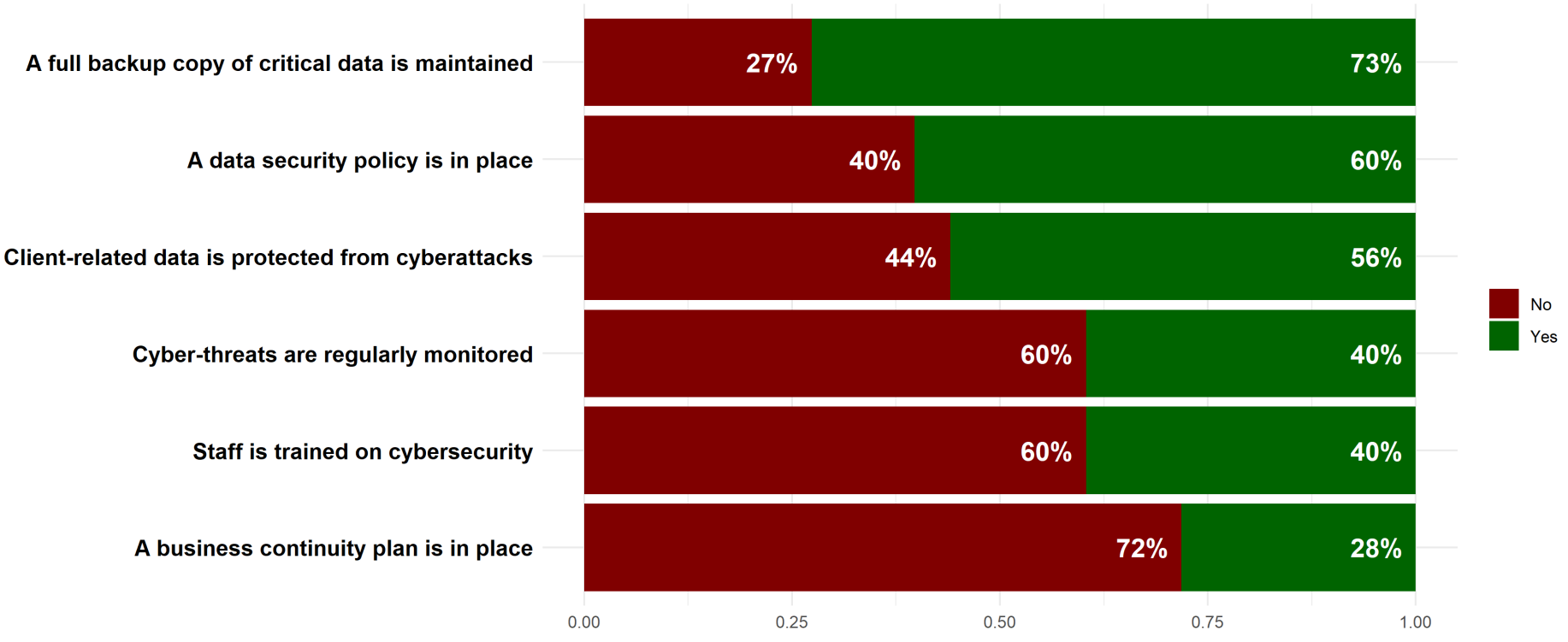
# DMA - Question 7

*How is your enterprise data managed (i.e. stored, organised, accessed and exploited)?*



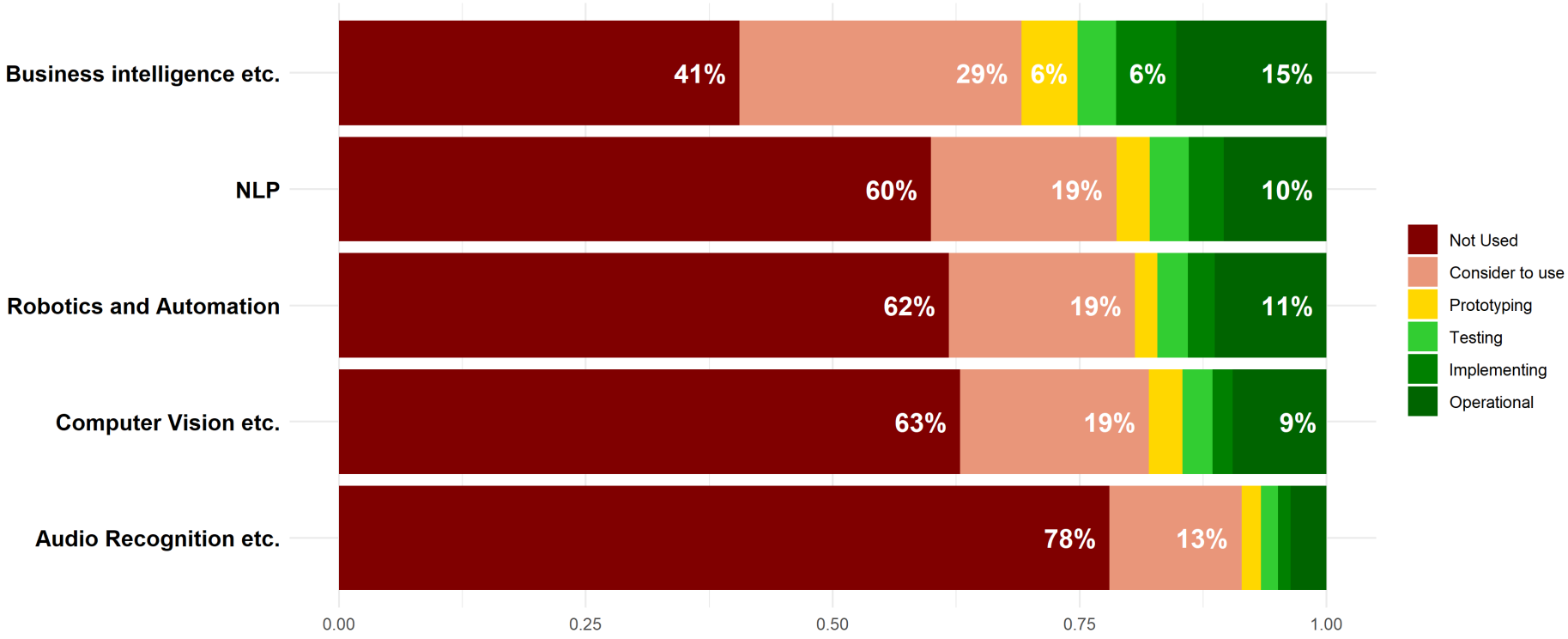
# DMA - Question 8

*Is your enterprise's data sufficiently secured?*



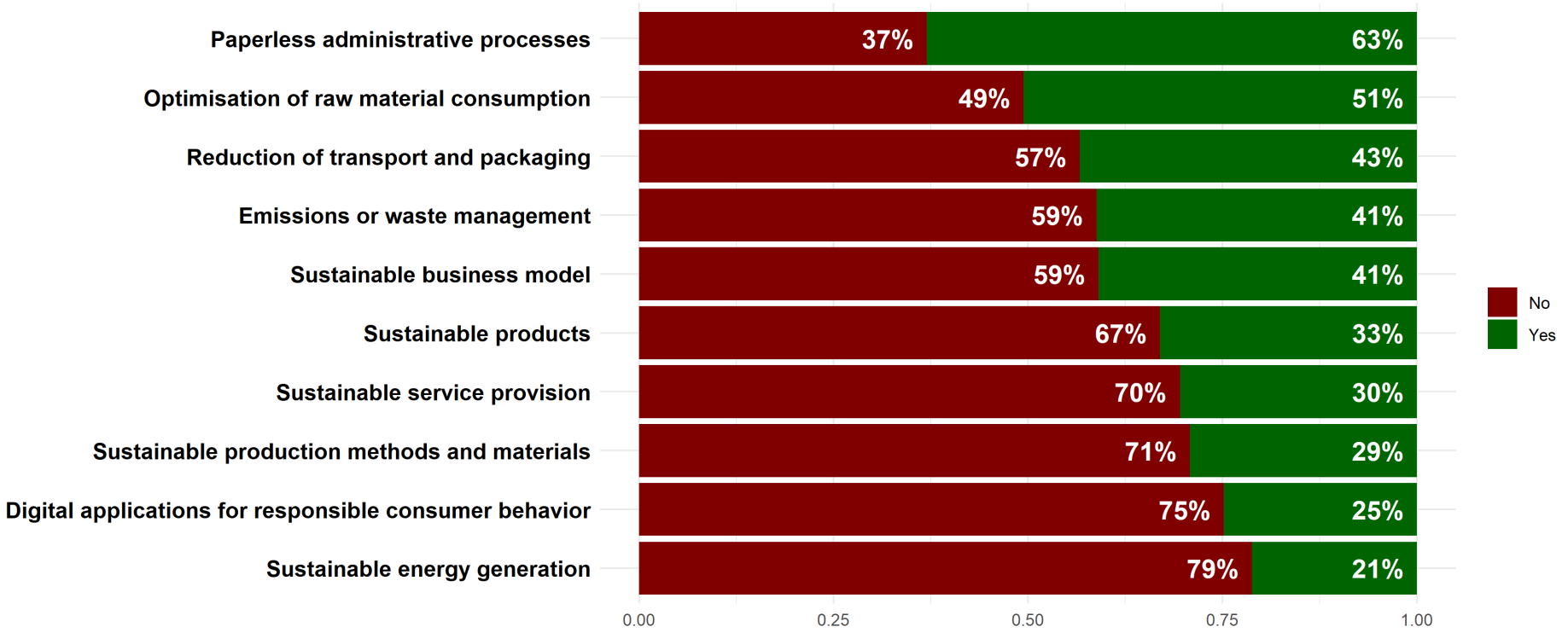
# DMA - Question 9

*Which of the following technologies and business applications are your enterprise already using?*



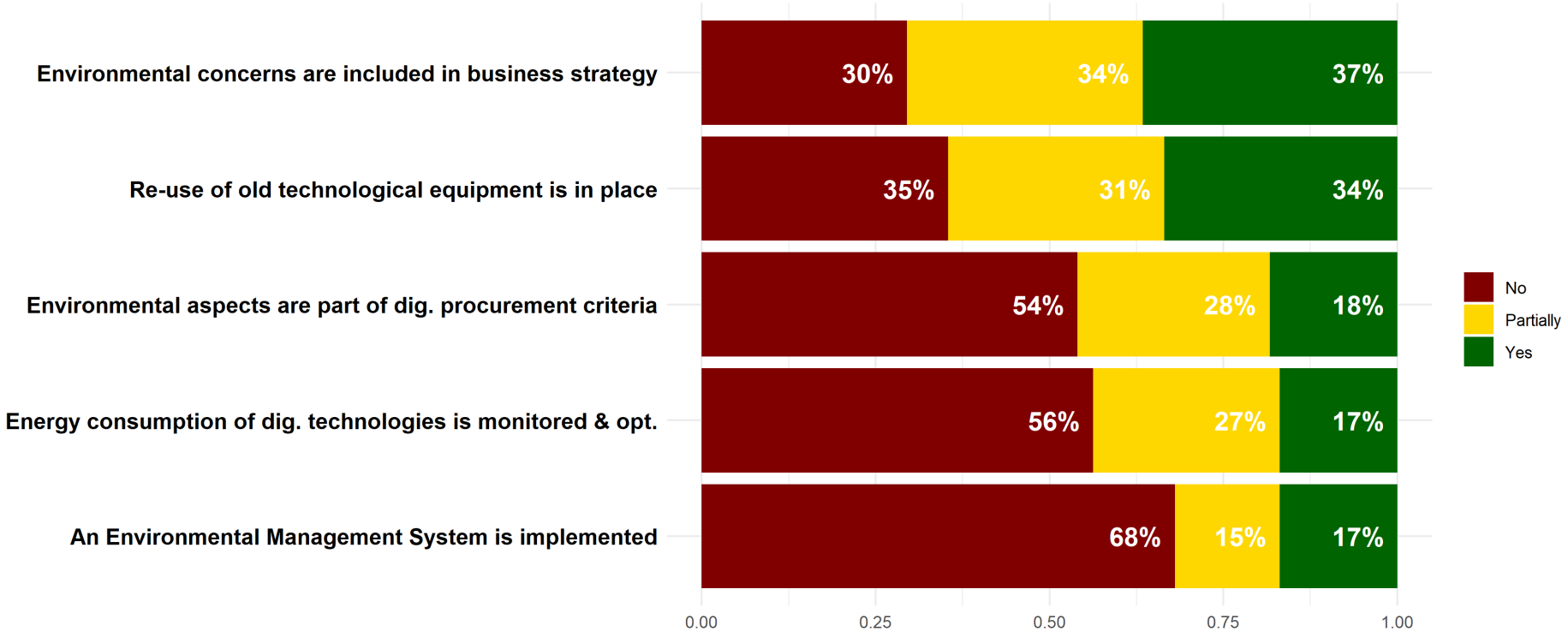
# DMA - Question 10

*How does your enterprise make use of digital technologies to contribute to environmental sustainability?*

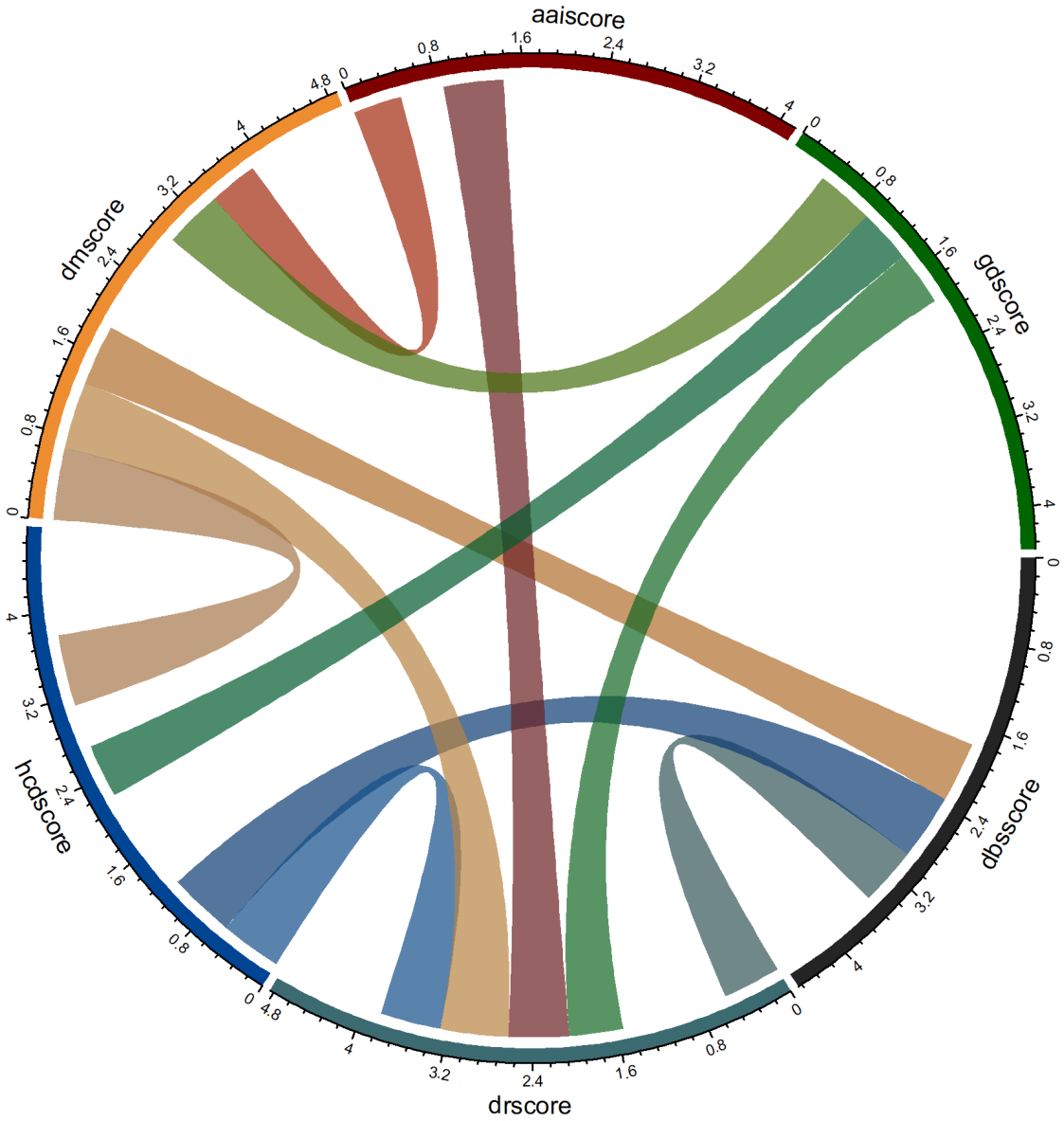


# DMA - Question 11

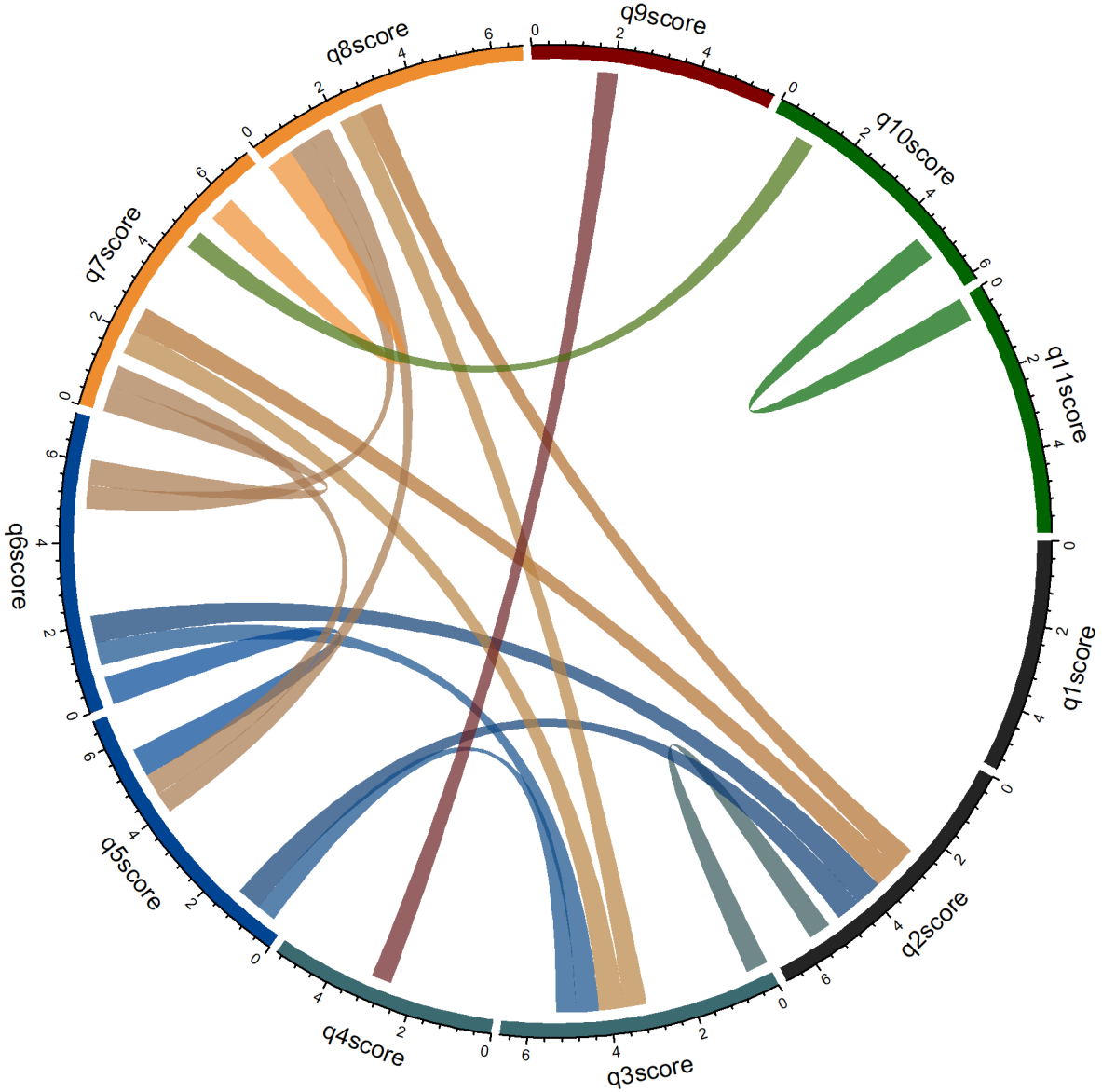
*Is your enterprise taking into account environmental impacts in its digital choices and practices?*



# DMA - Correlation Matrix of Dimensions

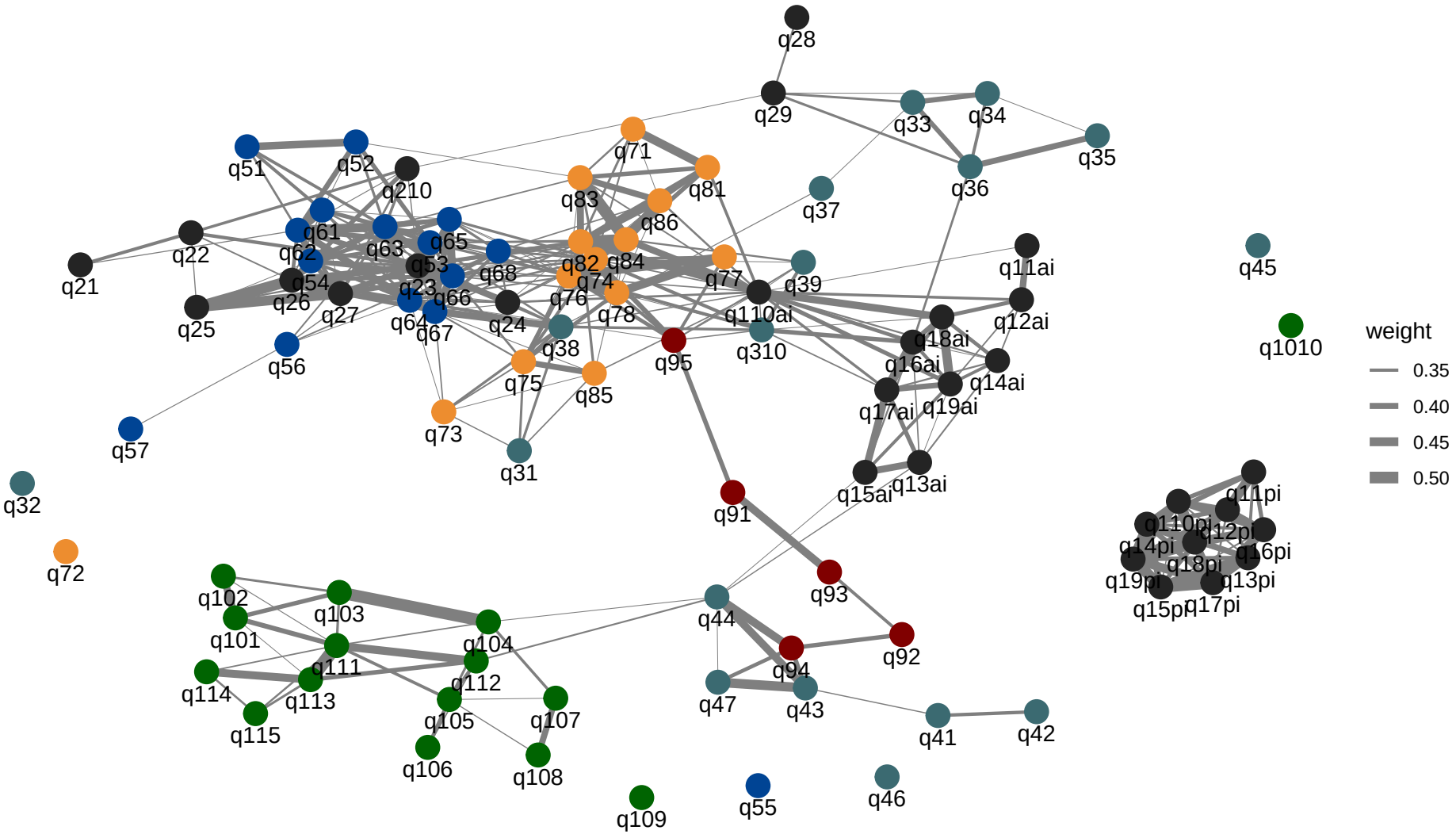


# DMA - Correlation Matrix of Subdimensions



# DMA - Network of Question Items

Network Graph (only correlations above 0.3)

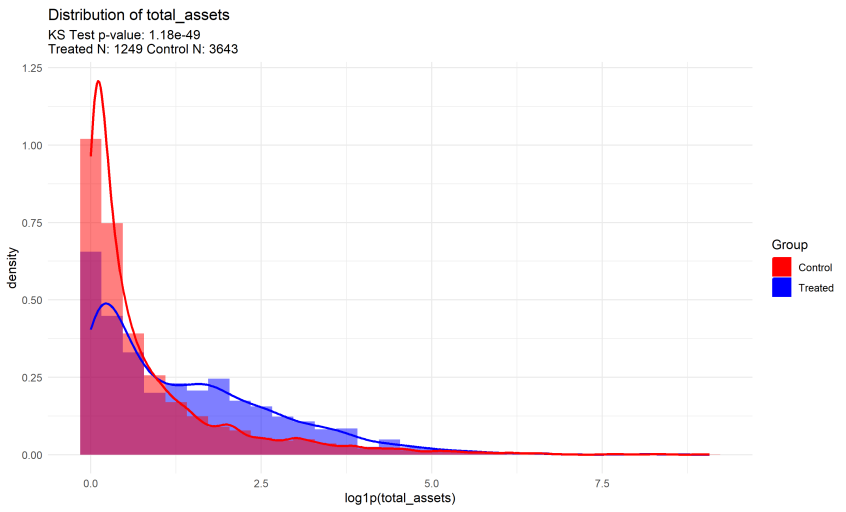


# Treated vs Control - Comparison Table

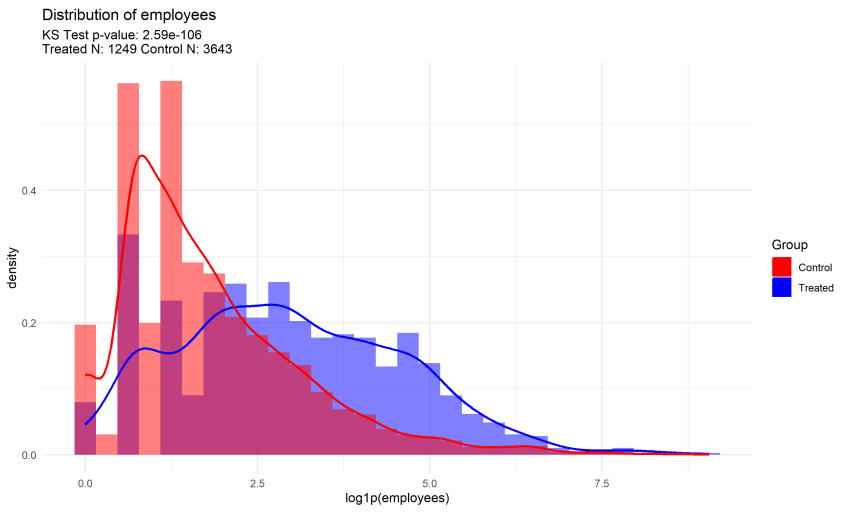
| Statistic | Treated_0 | Treated_1 | p_value |
|---|---|---|---|
| N | 3643.00 | 1249.00 | |
| Mean_Employees | 0.03 | 0.09 | 0.00 |
| SD_Employees | 0.17 | 0.37 | |
| Mean_TotalAssets | 14.09 | 15.18 | 0.80 |
| SD_TotalAssets | 185.97 | 108.15 | |
| Mean_LiquidityRatio | 4.15 | 2.33 | 0.00 |
| SD_LiquidityRatio | 8.41 | 2.90 | |
| Mean_Solvency | 37.65 | 50.51 | 0.00 |
| SD_Solvency | 35.45 | 25.62 | |
| Mean_turnover | 9.15 | 16.02 | 0.00 |
| SD_turnover | 70.39 | 74.00 | |

Table: Comparison between Control Firms (Treated = 0) and Treated ones (Treated = 1), with p-values for the t-test of equal means

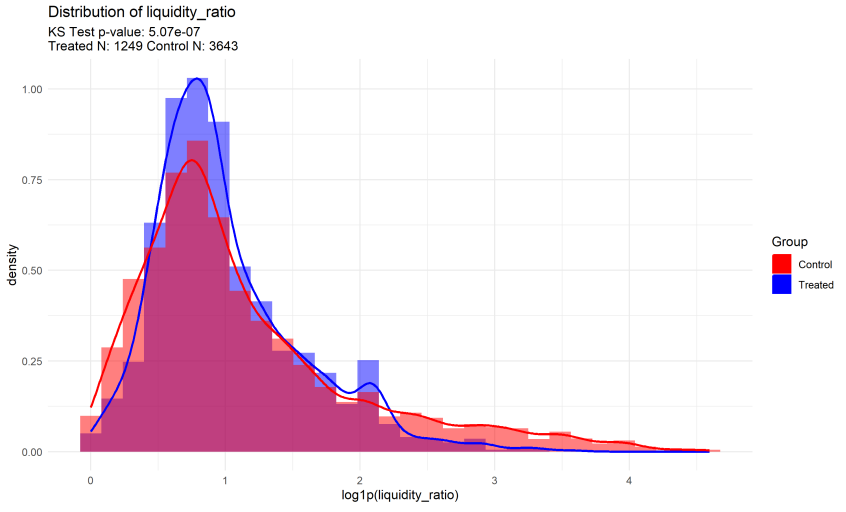
# Treated vs Control - Distributions Compared



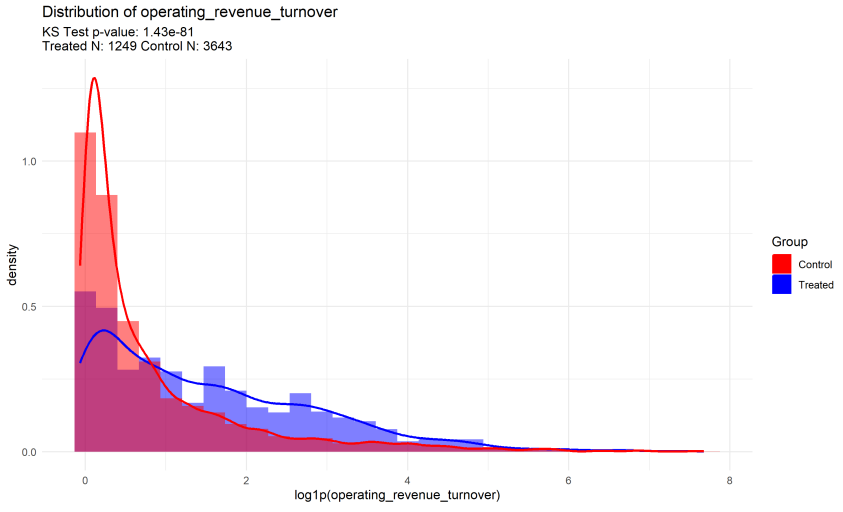

(a) Total Assets




(b) Employees

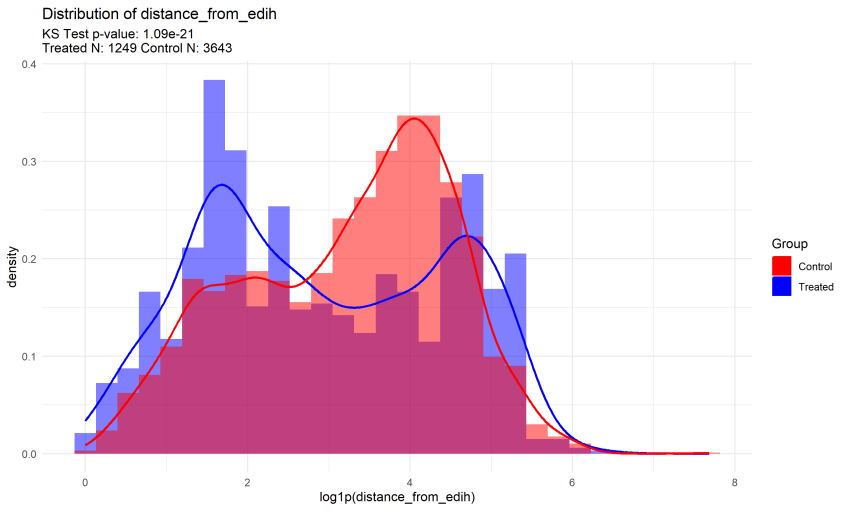



(c) Liquidity Ratio

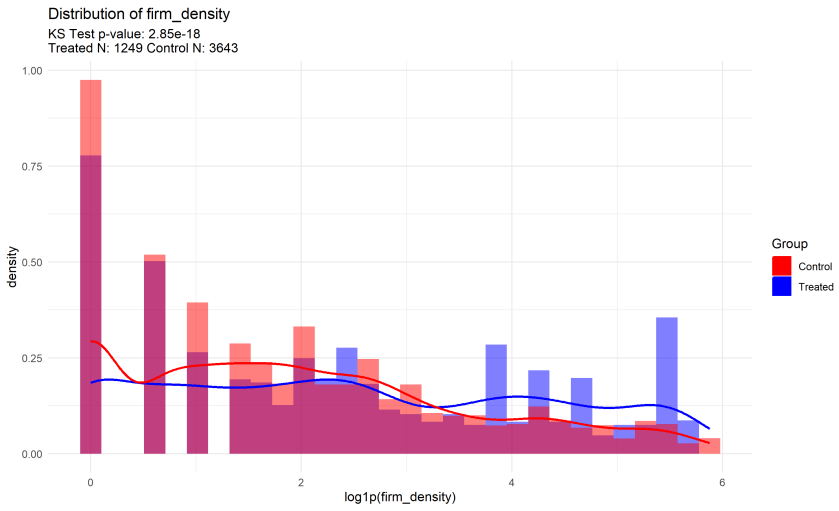



(d) Turnover

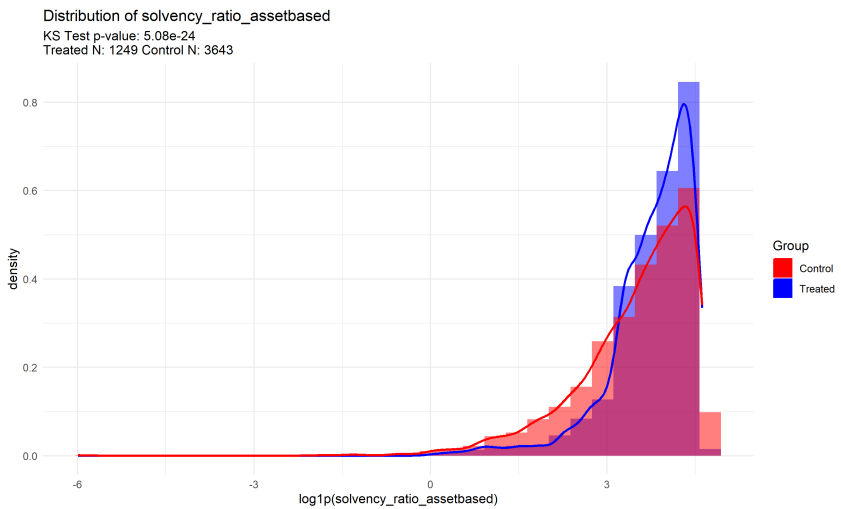
# Treated vs Control - Distributions Compared Part 2




(a) Distance from EDIH



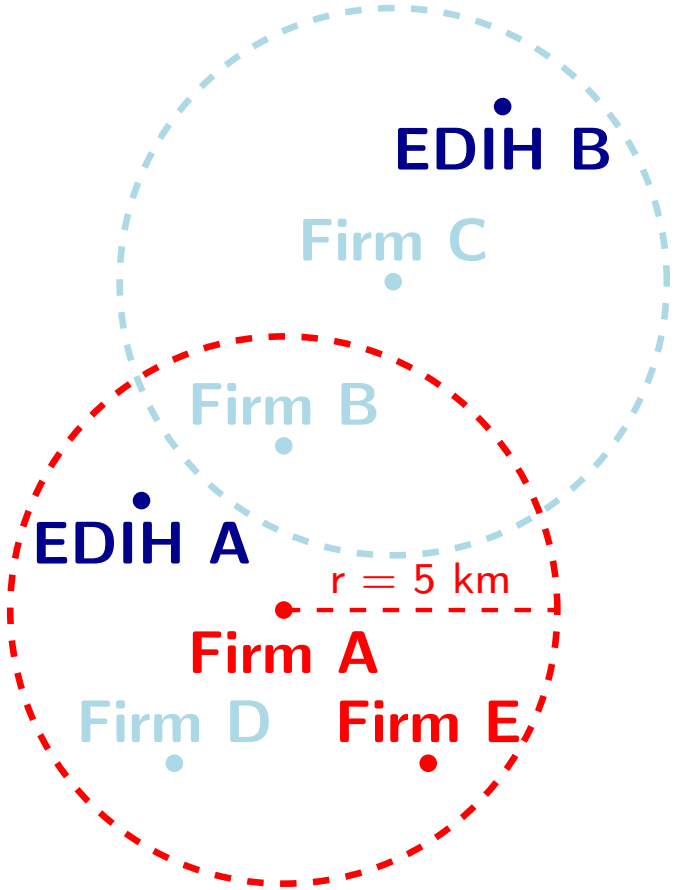

(b) Firm Density




(c) Solvency Ratio

# Firm Density - Definition

- **Definition:** Firm density is defined as the number of firms within a 5 km radius of a given firm, excluding EDIHs.



# Regression Results - Sectoral Subsamples

| | *Dependent variable: Treated* | | |
|---|---|---|---|
| | Manufacturing | Services | Other |
| Dist. from EDIH | −0.004*** | −0.001** | −0.001 |
| | (0.001) | (0.001) | (0.001) |
| Firm Density | −0.004** | 0.002*** | 0.001 |
| | (0.002) | (0.001) | (0.002) |
| High Tech | 0.603 | 1.769*** | |
| | (0.698) | (0.255) | |
| Medium Tech | 0.605 | | 0.784** |
| | (0.655) | | (0.383) |
| Medium-High Tech | 1.333** | 1.669*** | |
| | (0.644) | (0.106) | |
| Medium-Low Tech | 0.781 | 0.554*** | 0.733 |
| | (0.640) | (0.080) | (0.615) |
| Turnover | −0.003*** | 0.001** | −0.004*** |
| | (0.001) | (0.001) | (0.001) |
| Employees | 1.664*** | 0.616*** | 9.114*** |
| | (0.484) | (0.170) | (1.615) |
| Liquidity Ratio | −0.118*** | −0.086*** | −0.100*** |
| | (0.023) | (0.010) | (0.035) |
| Solvency Ratio | 0.015*** | 0.010*** | 0.009*** |
| | (0.003) | (0.001) | (0.003) |
| Observations | 842 | 3,084 | 938 |
| *Note:* | | | *p<0.1; **p<0.05; ***p<0.01 |

# References


Draghi, Mario. 2024. *Report on the Future of European Competitiveness.* Presented to Ursula von der Leyen on September 9, 2024. European Commission.

European Commission. 2021. "DIGITAL Europe Programme."