



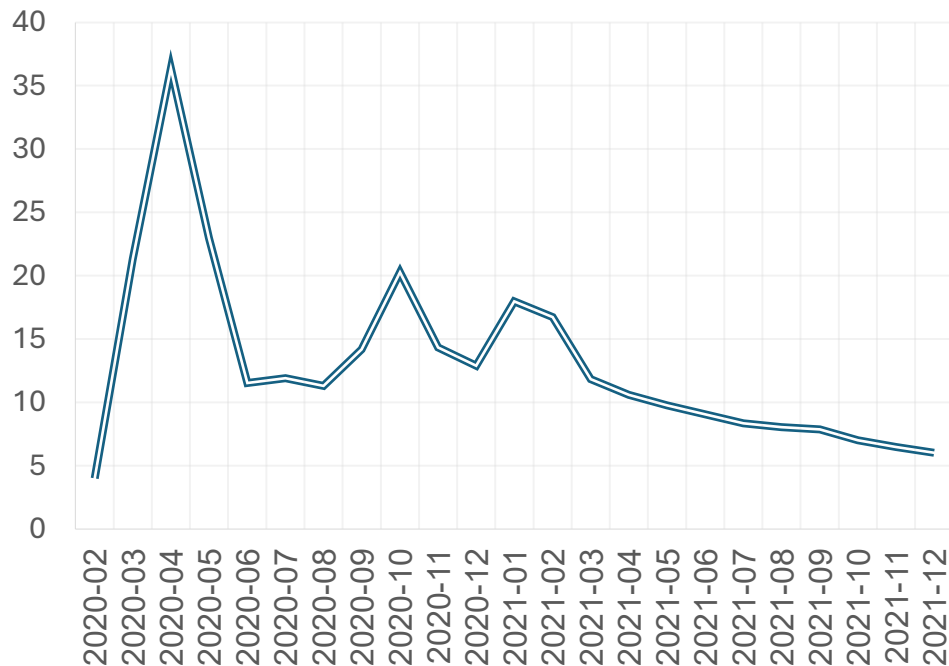
The Quick Recovery of Firms with High Digital Intensity (DII) in the Covid Crisis

Daniel Roash , Gil Epstein , Sarit Goldner

The Labor Market during 2021

The peak of the unemployment rate occurred at the beginning of the crisis in the second quarter of 2020. The vaccine rollout that began in early 2021 altered the virus's impact, leading to a consistent decrease in the unemployment rate throughout the year. The end of the government's labor market support scheme in mid-2021 influenced many unemployed individuals to re-enter the labor market. By the end of the year, the broad unemployment rate had decreased to 6.5%.

UNEMPLOYMENT RATE * 2020-2021



Research Questions

Do ICT-Intensive firms outperform also during the recovery period of the crisis ?

If so, what is the mechanism behind the quick recovery of these firms ?

Literature Review on Firm's Recovery

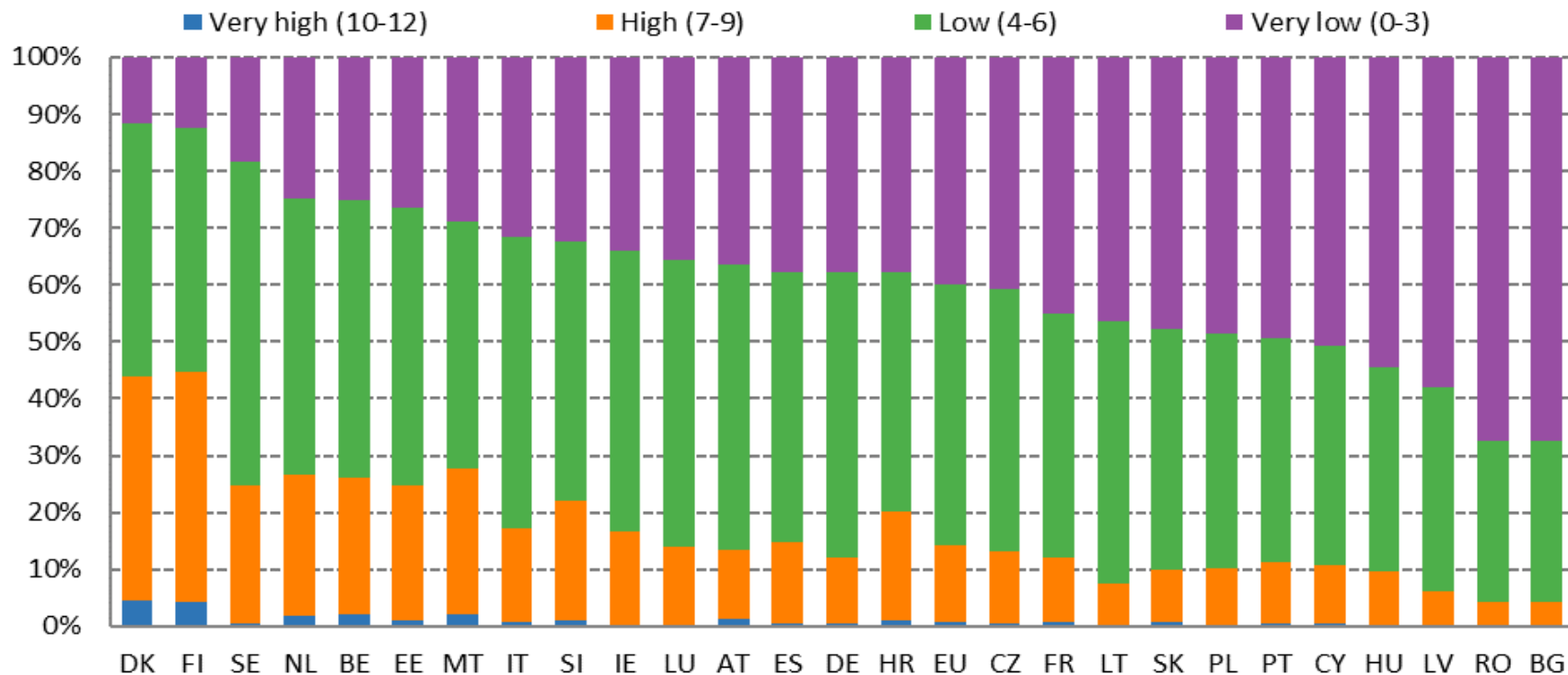
- ❑ Innovation capacity and firm's resilience during the Covid
Duchek, S. (2020). Miceli, Antonio, et al(2021)
- ❑ Evidences for Digital Gap Increases
Valero, A et al (2021)
- ❑ Negative effects of governmental schemes on job transitions and employer-employee relations
Hijzen, A., & Salvatori, A. (2022)



Digital Intensity Index EU methodology

Type of technology	Technology
Infrastructures Technologies	1. Companies that employ ICT experts
	2. Companies where the internet speed is more than 30 megabytes per second
	3. Companies that provide more than 20% of employees with a mobile device that connects to the Internet
Basic Technologies	4. Companies where more than 50% of the employees use the Internet for work purposes
	5. Companies with a website
	6. Companies whose website has advanced functions (order tracking, personalization, etc.)
Advanced Technologies	7. Companies that purchase advanced cloud services (CRM, computing power, accounting, or financing software, etc.)
	8. Companies that send e-invoices that are adapted to automation processes
	9. Companies that have online commerce
Cutting Edge Technologies	10. Companies that use robots: industry or service
	11. Companies where 3D printing is performed
	12. Companies that analyze Big Data within the company or outsourced

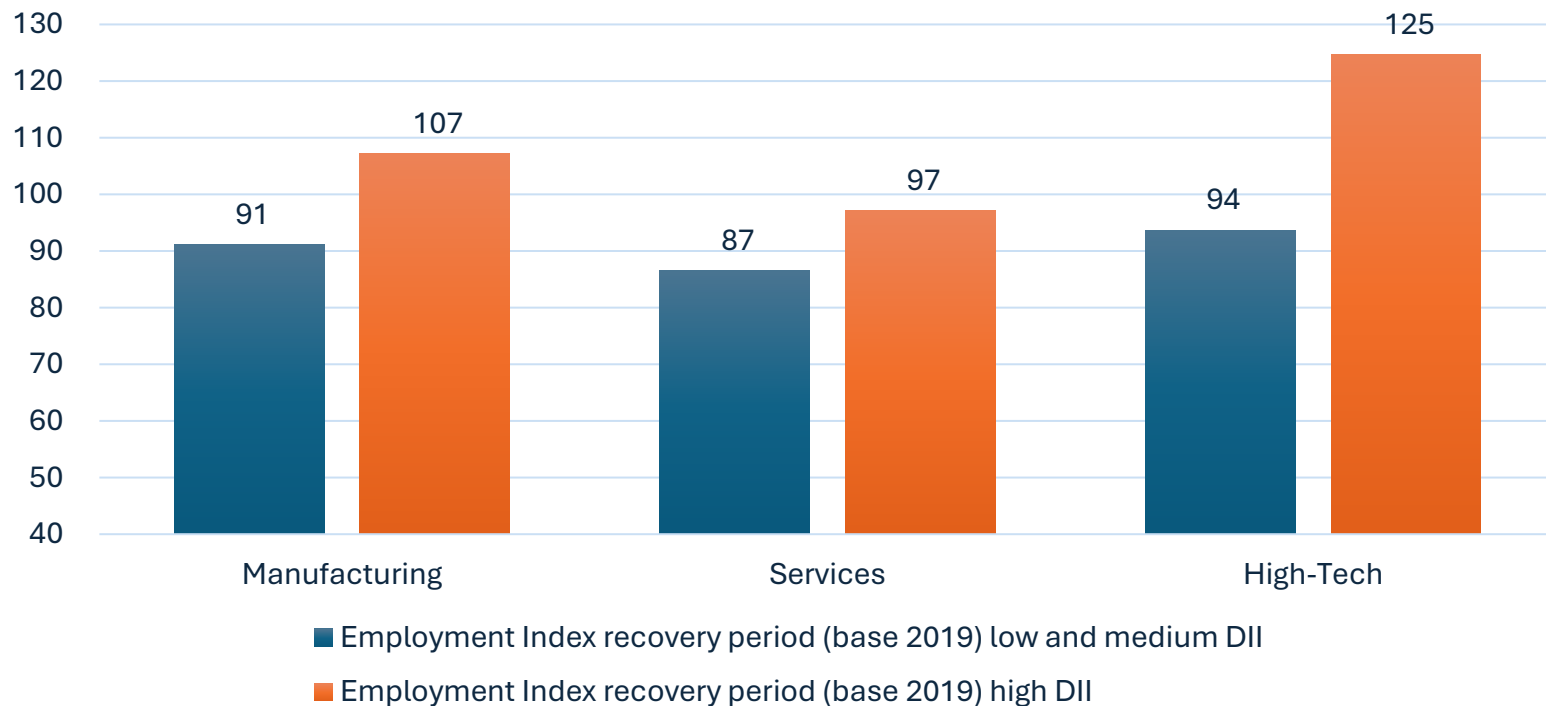
Digital Intensity Index for international comparability



Productivity and digital intensity

Digital intensity	Above median productivity	Below median productivity	Total
Low-intensity firms	48	116	164
Medium-intensity firms	206	266	472
High-intensity firms	375	250	625
Total	629	632	1261

Employment Index recovery period



The model and explanatory variables

Our explained variable is the employment index of the companies (compared to their situation before the coronavirus) in the third quarter of 2021 (the quarter in which the furlough program ceased) where the target variables are:

1. Companies with low technological digital intensity (score of 0-2 in DII)
2. Companies with medium digital technological intensity (score of 3-5 in DII)
3. Companies with high digital technological intensity (score of 6 or higher in DII)

The model and explanatory variables

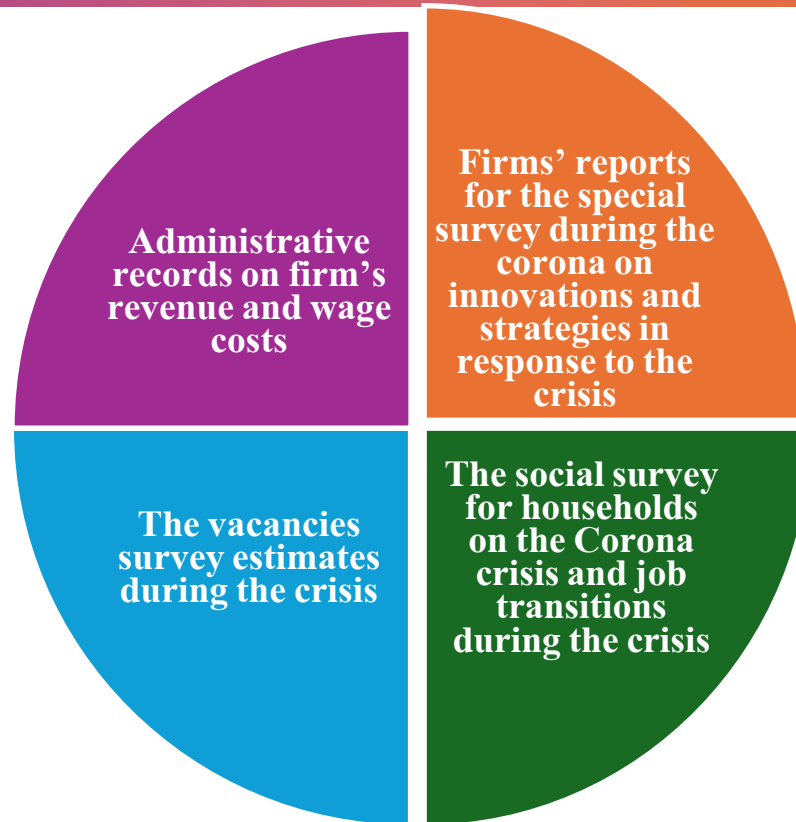
$$\text{employment_rate}_{i(t+1)} = \alpha + \beta_1 \text{digital_high}_{it} + \beta_2 \text{digital_medium}_{it} + \beta_3 \text{productivity}_{i(t-1)} + \beta_4 \text{lockdown_decrease}_{it} + \beta_5 X_{i(t-1)} + \varepsilon_{it+1}$$

1. The explained variable is the employment index of each company where the year 2019=100
2. The target variables were divided into 3 dummies to allow non-linear behavior, as well as the productivity quadrant per employee
3. After several sensitive examinations, it was decided to split the decrease in employment at the height of the crisis (second quarter of 2020) into parts for companies that experienced a decrease of less than 10%, companies that experienced a decrease of between 10% and 30% in employment, and companies that experienced a decrease of more than 30%

Table 2: OLS Regression Results

Variable	OLS model
Dummy High DII firms ^a	0.126** (0.042)
Dummy Medium DII Firms	0.046 (0.037)
Dummy Medium Decrease First Lockdown	-0.23*** (0.034)
Dummy High Decrease First Lockdown	-0.64*** (0.034)
Prod Quantile 2	0.001 (0.042)
Prod Quantile 3	0.038 (0.042)
Prod Quantile 4	0.007 (0.042)
Constant	0.008 (0.042)

Data Sources for the Research



Product and Process Innovation In Response To The Crisis

- In July 2020 the CBS conducted the 7th wave of the special survey
- The survey explores the innovative responses of the firms to face the crisis.
- The managers were presented with pre-defined common innovative product/actions and asked to indicate yes/no

Product and Process Innovation In Response To The Crisis

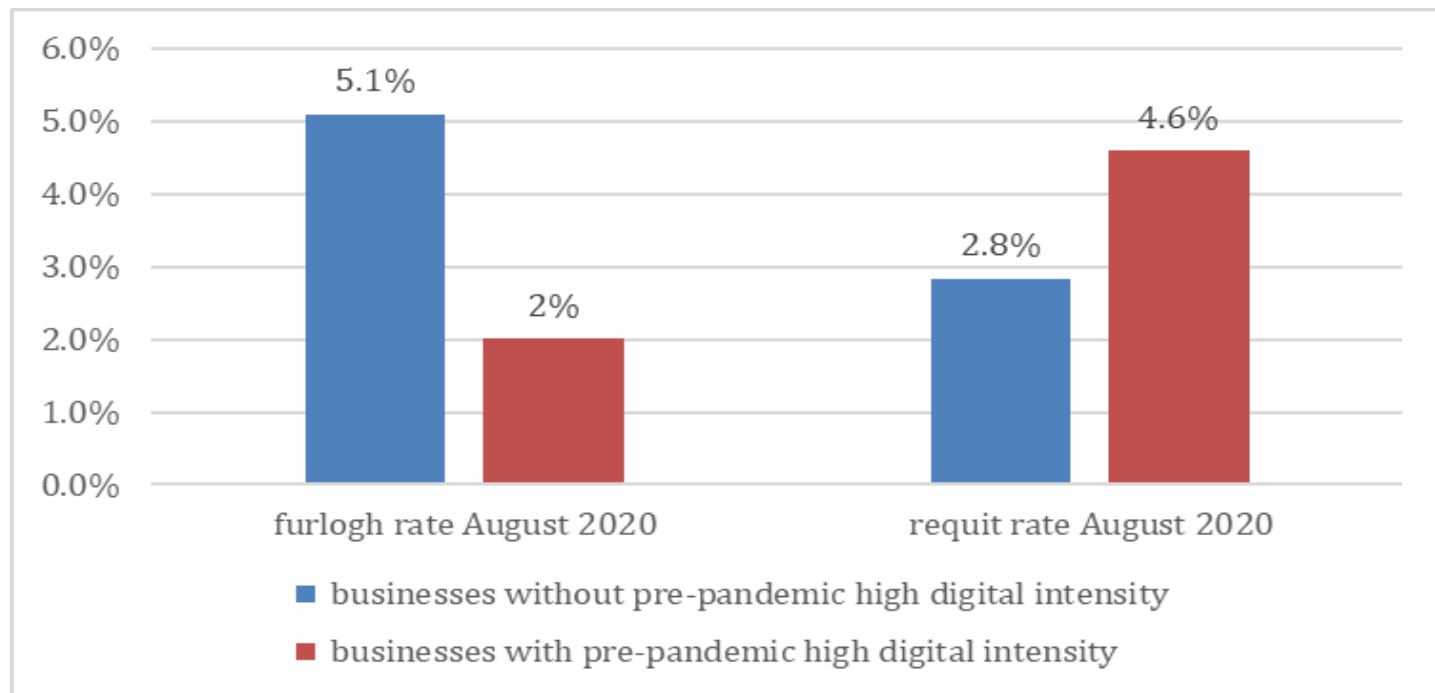
$$pr(\text{innovation}_{it} = 1) = \alpha + \beta_1 X_i + \beta_2 \text{productivity}_{i(t-1)} + \beta_3 \text{high_dii}_{i(t-1)} + \varepsilon_{it}$$

1. Establishment of work from home with remote access to firm's resources
2. Modification to the firm's products
3. Expanding to new markets

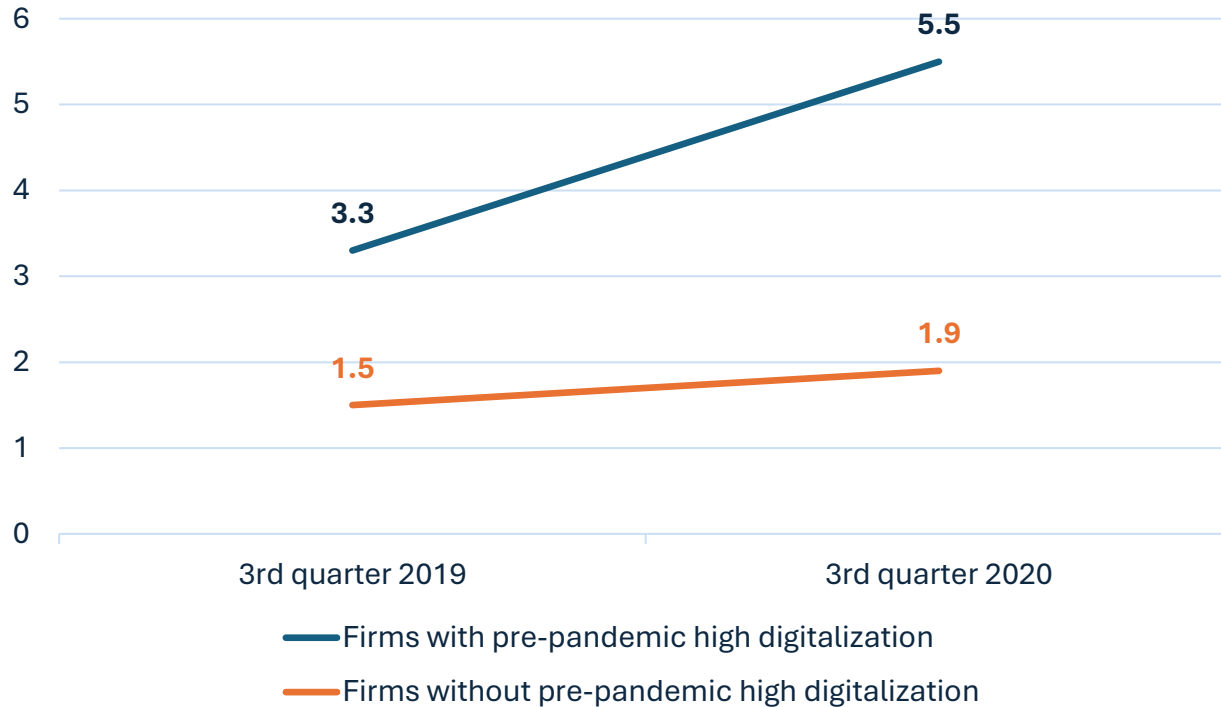
The Probability for Product/Process Innovation

Variable	Logistic regression coefficient	Marginal Effect
Dummy High DII firms ^a	0.41**	14%
Emplyment Size	0.046	
Prod Quantile 2	0.47*	17%
Prod Quantile 3	0.49*	17%
Prod Quantile 4	0.44*	15%
Constant	0.18	
Sector Fixed Effect	YES	YES
Number of Ocbervation	237	237

Resilience through all the crisis period



Average Job Vacancy Rate for ICT Workers



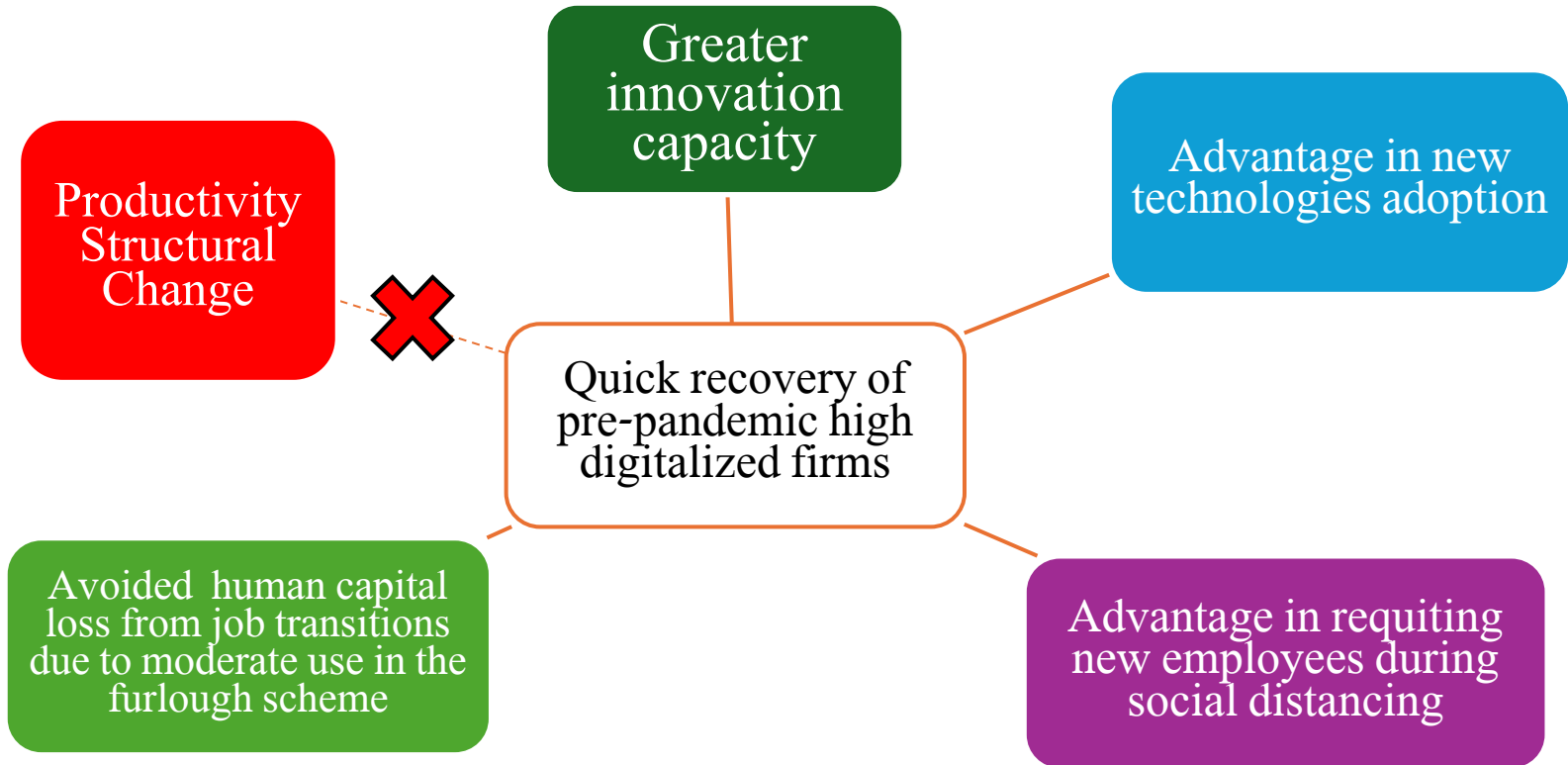
Logistic Regression- The Probability to Change Employer During the Crisis

Variable	Probability to Change Employer
Remote Work	↓
High-Tech industry	↑
Furlough	↑
Essential Industries	↓
Job Satisfacion	↓
Younger than 30	↑
Academic Occupation	↑

Summary of Key Mechanisms Driving Rapid Recovery among High DII Firms

Findings	Period and data source	Pathways to quick recovery
Logistic regression shows higher probability to engage in innovation activities	July 2020 the special CBS survey	Firms with high pre-pandemic Digital Intensity Index and innovation activities
The demand for technological workers increased sharply compared to 2019	Vacancies survey for 2019 and for 3 rd quarter of 2020	Firms with a high pre-pandemic Digital Intensity Index easily adopted new technologies
The rate of new workers in August 2020 for firms with high DII is substantially higher	August 2020 the special CBS survey	Firms with a high pre-pandemic Digital Intensity Index easily recruited new workers during the crisis
25% of the furloughed workers experienced a job transition compared to 10% of workers who remained employed throughout the entire crisis	The 2022 CBS Social Survey	Furloughed workers had higher probability to change employer

The relations between pre-pandemic digital capabilities to quick recovery in 2021



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