

THE IMPORTANCE OF THE EU REGIONAL SUPPORT PROGRAMMES FOR FIRM PERFORMANCE*

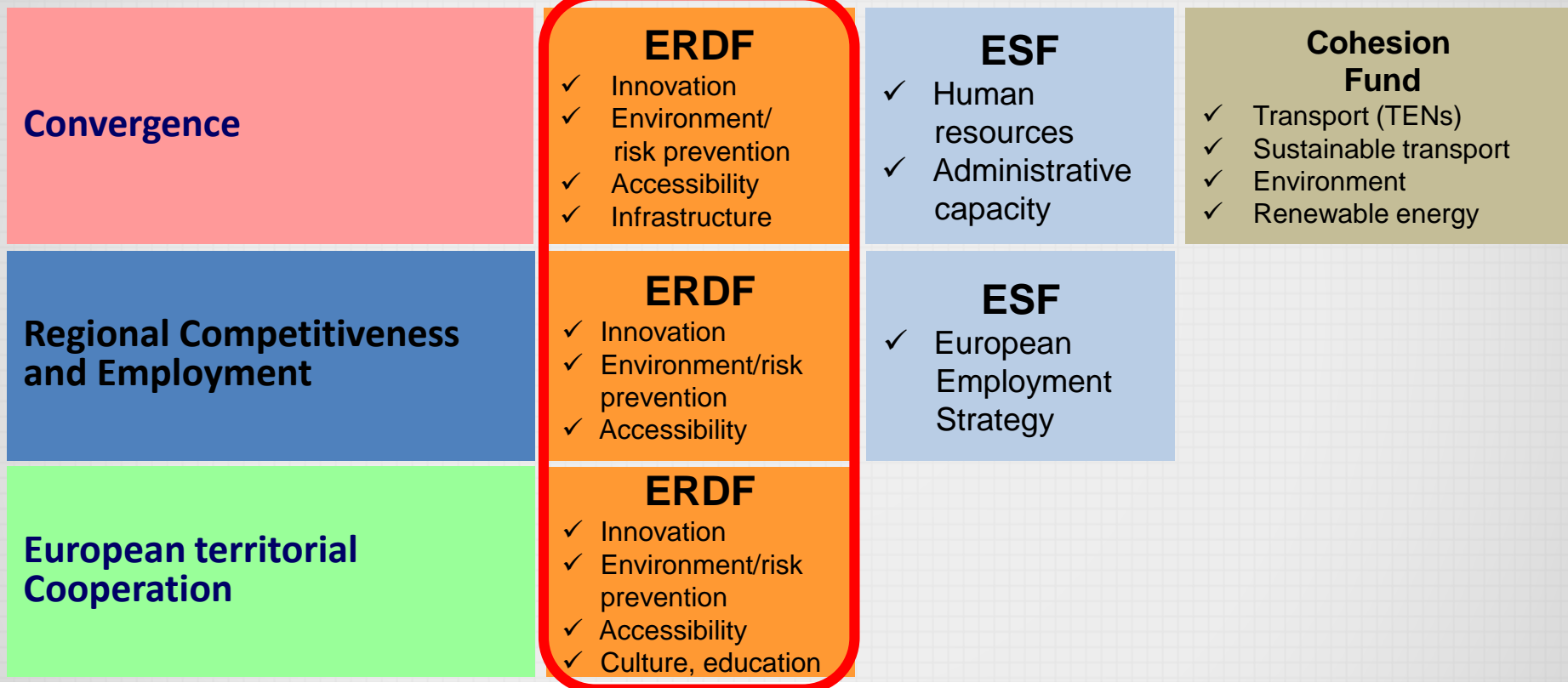
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* The views expressed are those of the authors and do not necessarily reflect the views of Latvijas Banka or the OECD

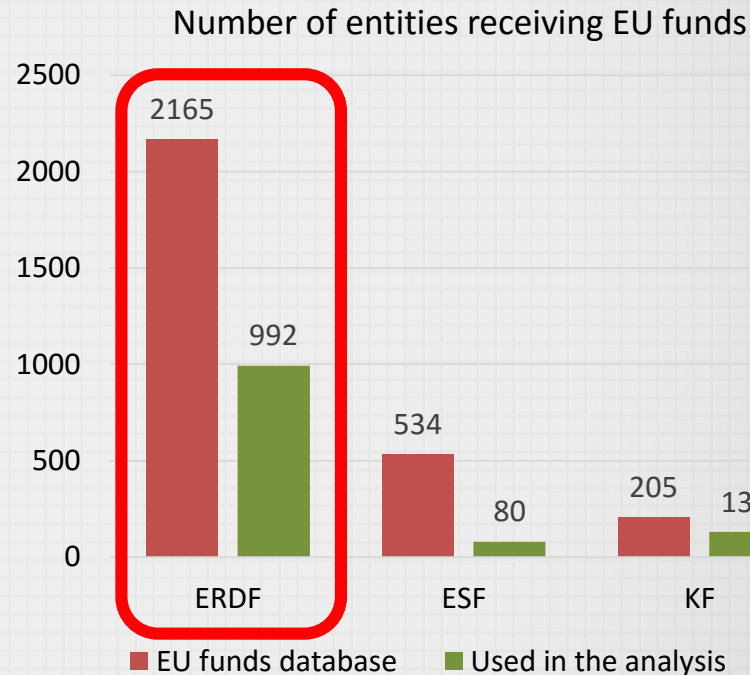
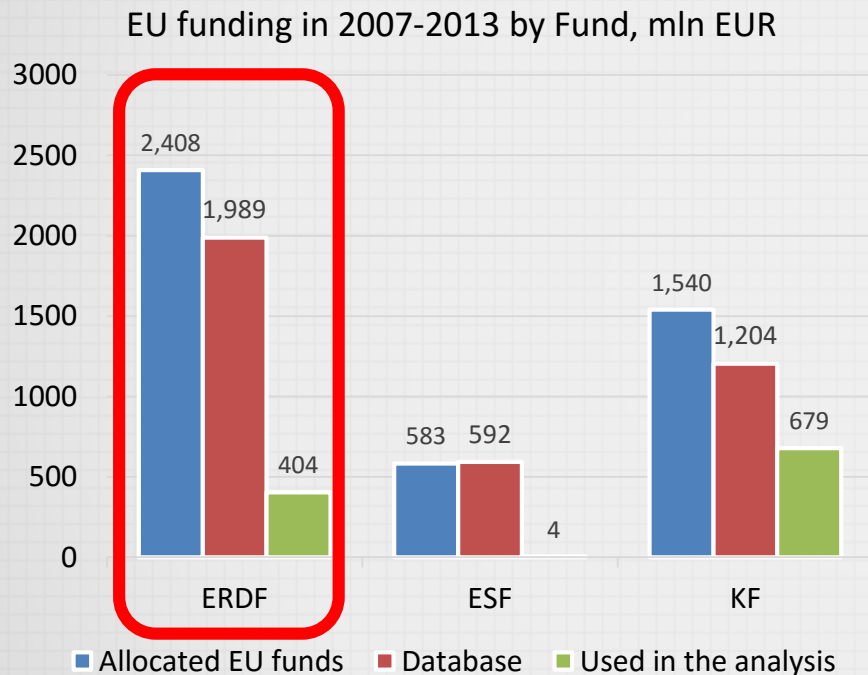
EU FUNDING 2007–2013: MAIN OBJECTIVES



SOME RELATED STUDIES

- ✓ A positive effect of participation in **EU farm programs** on individual farm sales in Germany in 2000–2005, with no effect on farm productivity (Pufahl and Weiss, 2008)
- ✓ The **EU support of R&D** is found to have a positive effect on Spanish companies' internal investment in R&D and employment (Arce and San Martin, 2016)
- ✓ The effect of the **EU regional policy** (ESF+ERDF+KF) on regional firm performance in almost all EU countries in 2000–2006 was found to be insignificant by de Zwaan and Merlevede (2014)

DATA USED IN THE ANALYSIS (1)



DATA USED IN THE ANALYSIS (2)

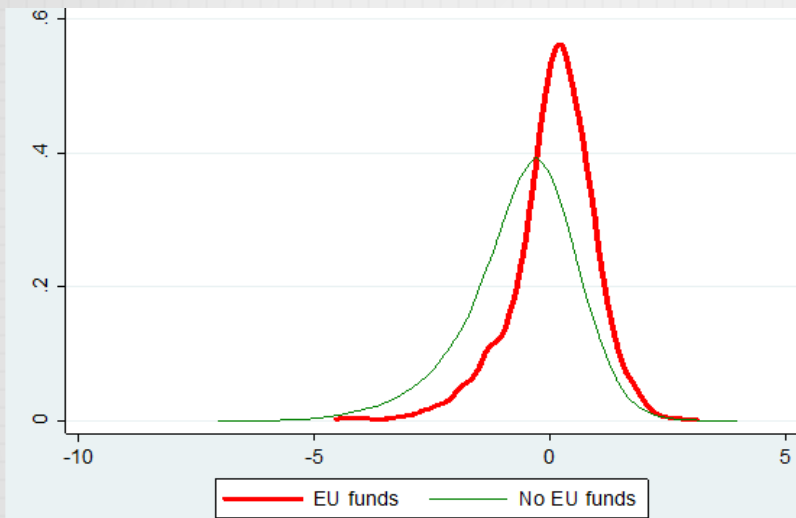
- **Firms' indicators comprehensive database** (Statistical office, State Revenue service)
 - Balance sheet data, profit and loss statements
 - Employment, value added
 - Sector, two-digit NACE classification
- **Merchandise trade database** (Statistical office)
 - Value and volume
 - Product, eight-digit Combined Nomenclature (CN8)
 - Destination
- **Service trade database** (Bank of Latvia)
 - Value
 - 47 types of services
- **External assets and liabilities** (Bank of Latvia)
 - FDI
 - Countries of origin
- **Employee-employer database** (Statistical office, State Revenue service)
 - Gross wage
 - Employment status, gender and age
- **EU funds database** (Ministry of Finance)

Total number of firms in the dataset

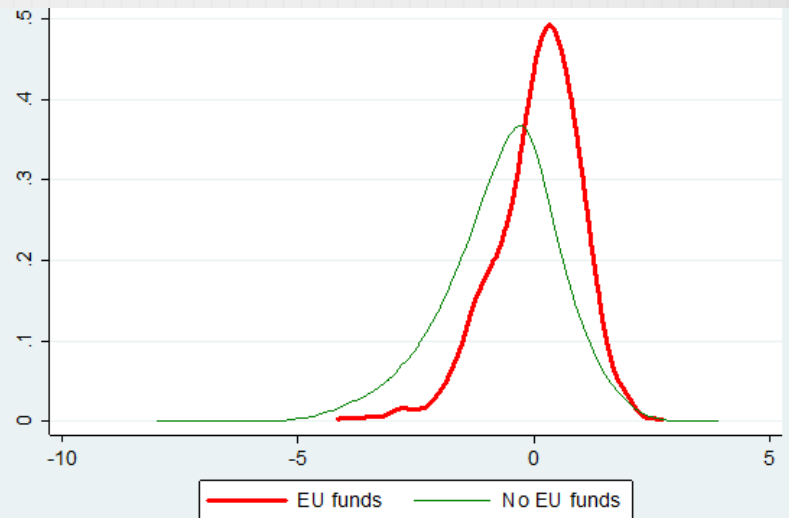
	All firms	Excluding small firms (<10 empl.)
2006	38462	5784
2007	47694	10259
2008	52428	10598
2009	55674	8435
2010	48363	7588
2011	51252	7750
2012	54161	8034
2013	62331	8360
2014	68200	8150

FIRMS RECEIVING EU FUNDS EXHIBIT HIGHER PRODUCTIVITY

log of labour productivity distribution, 2007-2014



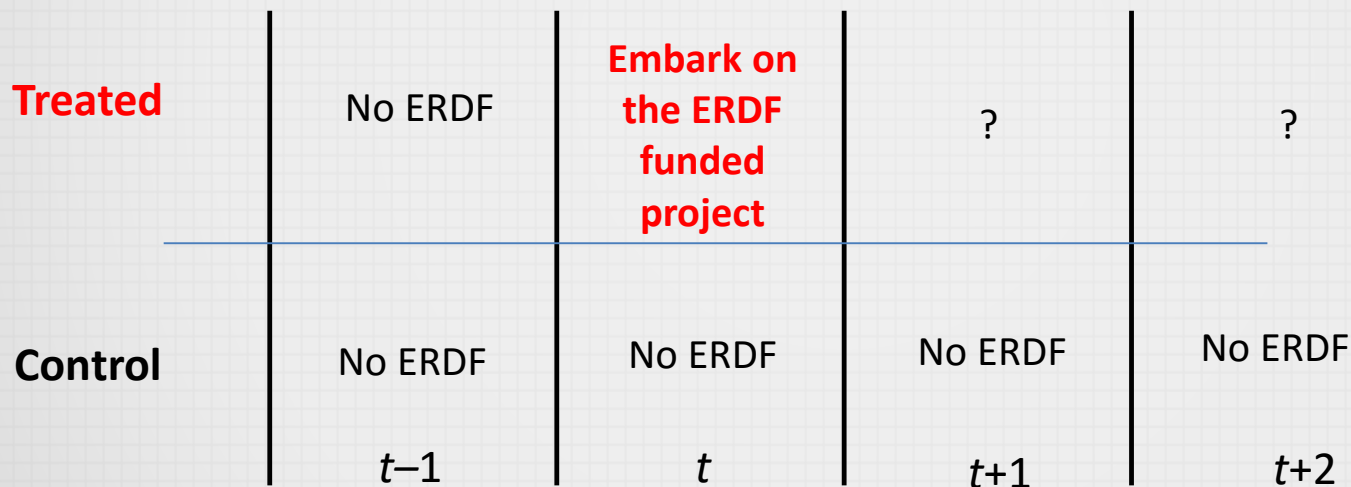
log of TFP distribution, 2007-2014



- Firms receiving EU funding appear to be more productive as compared to other Latvia's firms
- We don't however know the causality of this relationship

HOW DO WE DEFINE TREATMENT IN THIS STUDY?

- **Treatment group:** Firms that had not received ERDF funding until the period $t-1$ and started an ERDF funded project in period t
- **Control group:** Firms that did not take part in the ERDF support until $t+3$.



METHODOLOGICAL FRAMEWORK OF THE STUDY (1)

We use **propensity score matching (PSM)** – provides methods to match similar firms and create a counterfactual control group

STEP 1: Define a control group

In order to identify the probability of starting an ERDF funded project (propensity score) we estimate a **probit model**:

$$Pr(EU_{i,t} = 1) = F(Lprod_{i,t-1}, size_{i,t-1}, \dots, year_t, sector_i)$$

METHODOLOGICAL FRAMEWORK OF THE STUDY (2)

STEP 2: Define a control group

- Based on the propensity scores (PS) we match each firm in each treatment group to 1, 2 or 5 nearest neighbours among the potential controls (with and without a **caliper**)
- We ensure that both come from the **same 2-digit NACE sector and same year**
- We apply the common support condition: dropping entrants whose PS is higher than max/lower than min than control group.

Calculate the Difference-in-difference estimator (DiD)

$$DiD_s = \frac{1}{N_T} \sum_{i,t \in T} \left(\overbrace{Y_{i,t+s}}^{\text{treated}} - \sum_{j,t \in C} \overbrace{w_{ij} Y_{j,t+s}}^{\text{control}} \right)$$
$$Y_{i,t+s} = \ln y_{i,t+s} - \ln y_{i,t-1}; \quad s \in \{0,1,2\}$$

METHODOLOGICAL FRAMEWORK OF THE STUDY (3)

STEP 3: Estimate the heterogenous effects on firm performance

- Estimate the equation stating the DiD estimator s years after the start of a project as a function of pre-treatment characteristics and project parameters:

$$Y_{i,t+s} - \sum_{j,t \in C} w_{ij} Y_{j,t+s} = \alpha_0 + \alpha_1 F_i + \alpha_2 Z_i + \alpha_3 Macsec_i + \alpha_4 Year_i + e_{i,t}$$

- F_i are firm characteristics
- Z_i are project parameters

LARGE, YOUNG, PRODUCTIVE, EXPORTING FIRMS HAVE A HIGHER PROBABILITY TO ENGAGE IN ERDF

	Probit model
Log(labour productivity) _{t-1}	0.015
Log(labour productivity) _{t-1} ²	0.028***
Age _{t-1}	-0.070***
Age _{t-1} ²	0.003***
Log(employment) _{t-1}	0.380***
Log(employment) _{t-1} ²	-0.009
Log(capital to labour ratio) _{t-1}	0.100***
Log(capital to labour ratio) _{t-1} ²	-0.024***
Liquidity ratio _{t-1}	0.135
Indebtedness ratio _{t-1}	0.000
Exports of goods _{t-1}	0.490***
Exports of services _{t-1}	-0.120
FDI to OECD _{t-1}	-0.307***
FDI to non-OECD _{t-1}	-0.178
Employees with EU funds experience _{t-1}	0.338
Managers with EU funds experience _{t-1}	0.517
Number of observations	57836
Pseudo R ²	0.25

Probability to start receiving ERDF funds is higher for firms:

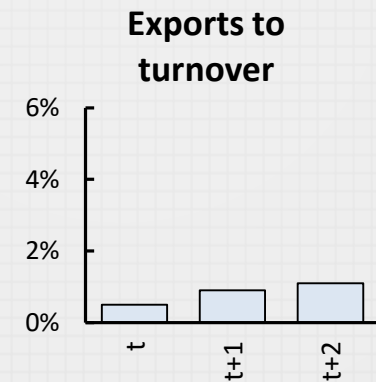
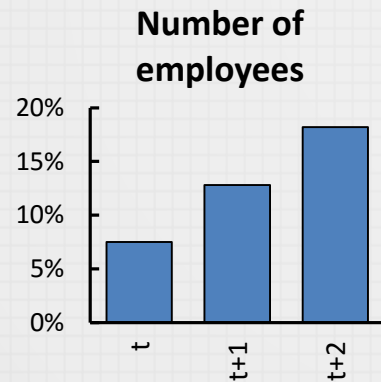
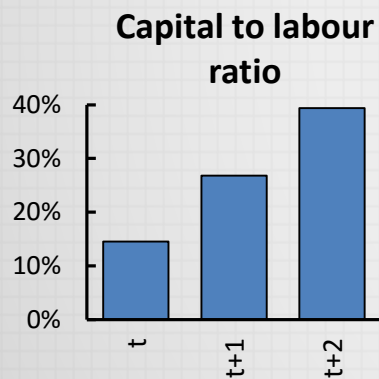
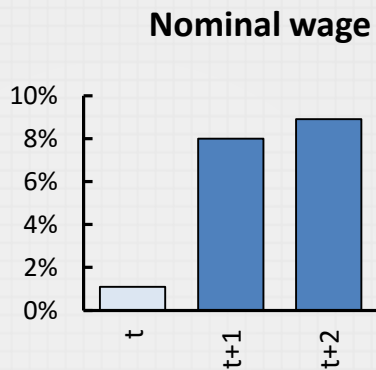
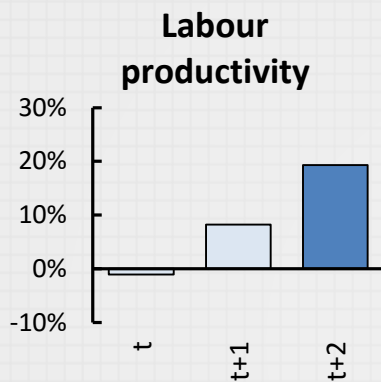
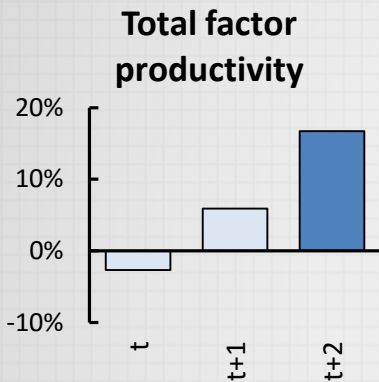
- with higher labour productivity
- that are larger and recently established
- with higher capital-to-labour ratios
- that do not belong to foreign companies from OECD
- goods exporting firms

MATCHING QUALITY

Indicators	Unmatched	NN(1)	NN(2)	NN(5)	NN(1)	NN(2)	NN(5)
		without caliper			caliper=0.05		
Log(labour productivity) _{t-1}	39.6***	-4.7	-4.2	-2.5	-5.3	-4.2	-3.6
Log(labour productivity) _{t-1} ²	38.1***	0.9	-1.9	0.3	0.4	-1.6	-0.9
Age _{t-1}	19.9***	0.0	2.5	0.9	-1.5	0.4	-1.6
Age _{t-1} ²	22.0***	0.9	3.2	1.2	-0.9	0.7	-1.5
Log(employment) _{t-1}	118.5***	6.4	9.4	14.0*	3.1	4.4	6.8
Log(employment) _{t-1} ²	106.6***	10.5	13.2	19.4**	5.6	5.8	9.4
Log(capital to labour ratio) _{t-1}	29.7***	1.7	0.6	1.8	-0.3	-1.4	-1.2
Log(capital to labour ratio) _{t-1} ²	7.9	4.5	0.4	0.9	2.6	-1.4	-1.5
Log(liquidity ratio) _{t-1}	-6.1	8.8	3.8	0.5	8.9	4.0	0.6
Log(indebtedness ratio) _{t-1}	-2.9	0.2	0.0	-0.2	0.2	0.4	-0.2
Exports of goods _{t-1}	75.3***	2.4	1.7	4.9	0.1	-2.5	-2.5
Exports of services _{t-1}	8.8*	-13.4	-8.5	-6.2	-13.7	-8.8	-7.0
Log(FDI to OECD) _{t-1}	23.6***	7.8	5.9	7.0	5.4	2.0	3.3
Log(FDI to non-OECD) _{t-1}	14.8***	0.0	-5.1	0.0	0.0	-7.3	-2.3
Employees_eu funds exper _{t-1}	7.4	4.9	-3.0	-0.1	5.3	-3.0	-0.2
Managers_eu funds exper _{t-1}	15.6***	5.1	4.4	0.6	5.4	4.1	-0.2

Setting a caliper to 0.05 drops 10 observations but ensures a more successful matching

IT TAKES TIME FOR PRODUCTIVITY PREMIA TO MATERIALIZE



Firms that obtain ERDF funding:

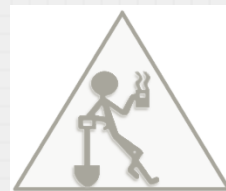
- increase capital-to-labour ratio immediately
- increase the number of employees
- manage to eventually raise both TFP and labour productivity as well as employees' remuneration

WHY IT TAKES TIME?

before EU funds

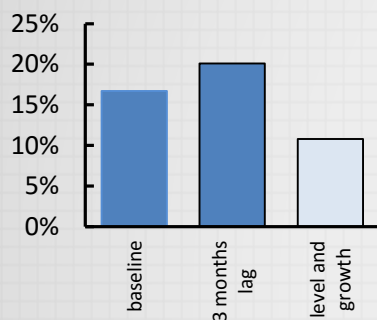
first year of EU funded project

afterwards...

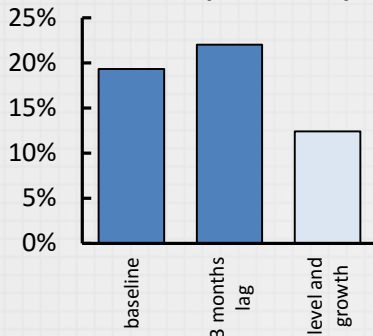


ROBUSTNESS CHECK: DIFFERENT MATCHING STRATEGIES

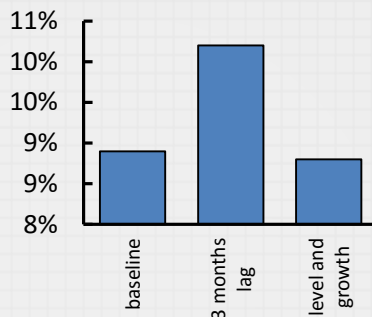
Total factor productivity



Labour productivity



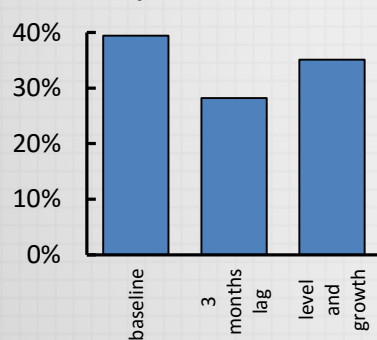
Nominal wage



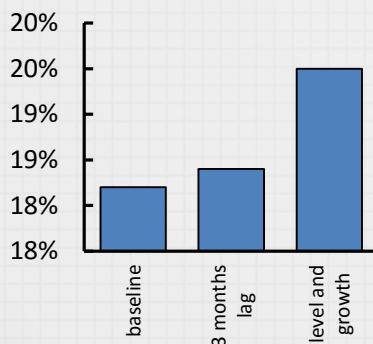
Two robustness checks:

- matching ERDF beneficiaries that start a project during the last 3 months of a year with non-beneficiaries in the next year;
- matching with non-beneficiaries also on the back of productivity growth (not just level)

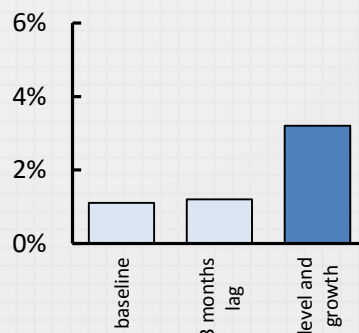
Capital to labour ratio



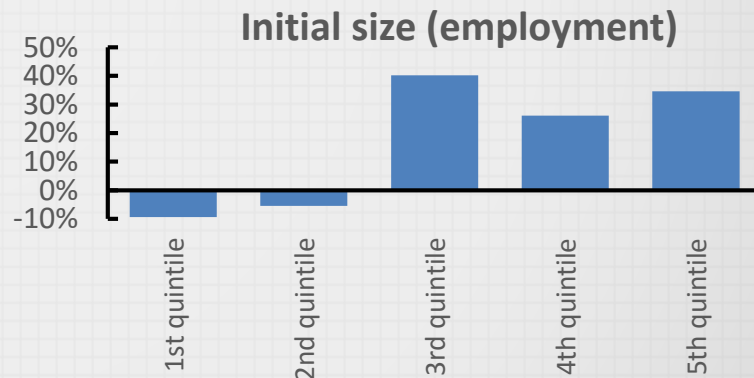
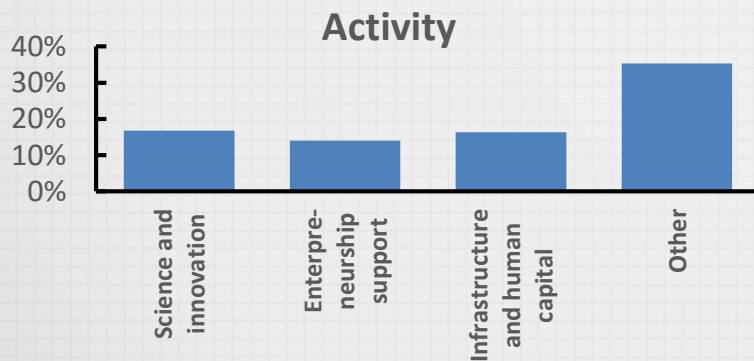
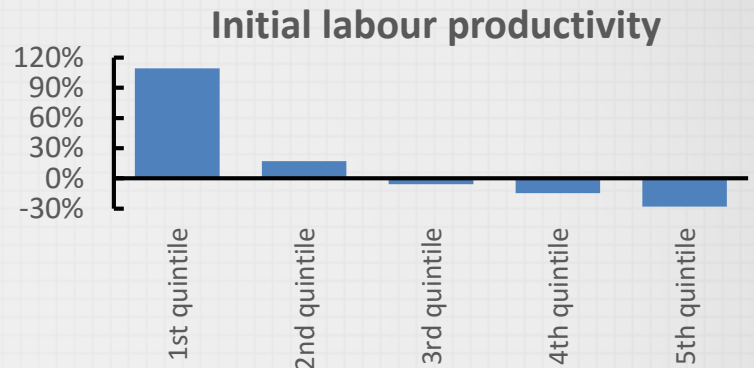
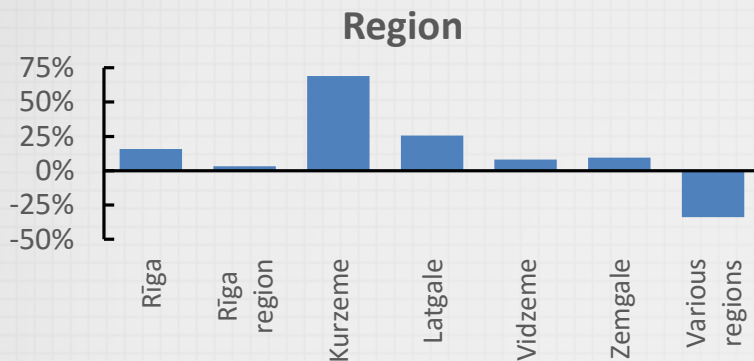
Number of employees



Exports to turnover



THE EFFECT ON LABOUR PRODUCTIVITY DIFFERS...



HETEROGENEITY OF DID: REGRESSION ANALYSIS

Factors affecting treatment effect on treated in $t+2$

	TFP	Labour productivity	Wage	Capital to labour ratio	Employment	Exports to turnover ratio
$\log(\text{TFP})_{t-1}$	-0.583***	-0.561***	-0.041	0.105	0.097**	0.023
$\log(\text{employment})_{t-1}$	0.291***	0.256***	0.055	-0.083	-0.134*	-0.023
Age_{t-1}	-0.015	-0.014	-0.011*	-0.001	-0.006	0.000
$\log(\text{K/L ratio})_{t-1}$	-0.009	-0.032	-0.018	-0.245***	0.038	-0.010
Risk of the project	-0.030	-0.022	-0.001	-0.056	-0.034	-0.038
$\log(\text{project size})$	0.021	0.016	0.015	0.001	-0.002	-0.009
Science and innovation	-0.170	-0.010	-0.263**	-0.014	-0.110	-0.028
Entrepreneurship support	0.139	0.287	0.040	0.138	-0.240	0.067
Environment	0.109	-0.100	-0.108	-1.262*	0.249	0.023
Year effects	Yes	Yes	Yes	Yes	Yes	Yes
Macroeconomic sectors effects	Yes	Yes	Yes	Yes	Yes	Yes
Region effects	Yes	Yes	Yes	Yes	Yes	Yes
Number of observations	362	362	362	362	362	362
R ²	0.343	0.329	0.113	0.254	0.162	0.088

- The effect on productivity is larger for initially bigger and less productive firms; the opposite holds for employment
- The effect on wages is more pronounced for younger firms

THE IMPACT OF THE FUNDING SOURCE

- ✓ Ederveen et al (2003) shows that **EU funding replaces a private one** to a certain degree
- ✓ Czarnitzki and Lopes Bento (2014) look at the effect of national subsidies for innovation in Germany compared to, or in combination with, the effect of European subsidies on innovation and R&D intensity. The study finds that **EU subsidies have smaller impact on firms' sales**
- ✓ In order to test for the impact of funding source we ensured that a paired control firm has experienced a **similar increase in capital-to-labour ratio** (rough proxy for similar investments) as a treated firm during the three-year period (comparing $t+2$ with $t-1$)

MATCHING QUALITY

Indicators	Unmatched	2 neighbours			
		5 groups of K/L growth		10 groups of K/L growth	
		no caliper	caliper=0.05	no caliper	caliper=0.05
Log(lprod) _{t-1}	39.6***	8.8	3.0	11.3	5.5
Log(lprod) _{t-1} ²	38.1***	12.4*	7.6	13.5*	8.6
Age _{t-1}	19.9***	2.3	-3.5	3.5	-5.8
Age _{t-1} ²	22.0***	2.6	-3.8	4.3	-5.7
Log(employment) _{t-1}	118.5***	25.9***	11.6	38.1***	19.1**
Log(employment) _{t-1} ²	106.6***	32.7***	15.2*	43.1***	21.3**
Log(capital to labour ratio) _{t-1}	29.7***	11.6*	9.4	12.1*	10.1
Log(capital to labour ratio) _{t-1} ²	7.9	8.6	4.8	8.6	5.0
Log(liquidity ratio) _{t-1}	-6.1	-1.7	0.0	-7.3	-3.5
Log(indebtedness ratio) _{t-1}	-2.9	-0.6	-0.7	-0.5	-0.2
Exports of goods _{t-1}	75.3***	10.0	-8.8	20.3**	-2.7
Exports of services _{t-1}	8.8*	-9.3	-11.6	-1.3	-3.7
Log(FDI to OECD) _{t-1}	23.6***	8.0	6.0	4.1	-3.1
Log(FDI to non-OECD) _{t-1}	14.8***	7.2	3.5	10.5	4.9
Employees_eu funds exper _{t-1}	7.4	-2.2	-2.3	2.1	-0.4
Managers_eu funds exper _{t-1}	15.6***	0.6	3.6	5.6	1.3
Capital to labour growth (between t+2 and t-1)	39.6***	2.6	3.5	1.8	2.8

Setting a caliper drops around 40 observations but ensures a more successful matching in particular when matching is implemented within 5 quintiles of capital growth

EU FUNDED PROJECTS RESULT IN EXPANDING FIRMS' SIZE

Difference-in-difference (DiD)

		2 neighbours			
		5 groups of K/L growth		10 groups of K/L growth	
		no caliper	caliper=0.05	no caliper	caliper=0.05
Log(TFP)	t	-0.026	-0.031	-0.033	-0.038
	t+1	0.056	0.085	0.050	0.047
	t+2	0.157**	0.192**	0.114	0.116
Log(labour productivity)	t	-0.051	-0.054	-0.049	-0.042
	t+1	0.012	0.039	0.011	0.015
	t+2	0.100	0.136*	0.078	0.087
Log(wage)	t	-0.006	-0.005	0.007	0.010
	t+1	0.056**	0.064**	0.044	0.057*
	t+2	0.072**	0.088**	0.049	0.056
Log(capital to labor ratio)	t	0.005	0.013	0.016	0.024
	t+1	0.007	0.028	0.001	0.014
	t+2	0.031	0.042	0.021	0.033
Log(employment)	t	0.105***	0.103***	0.096***	0.091***
	t+1	0.157***	0.154***	0.159***	0.151***
	t+2	0.218***	0.219***	0.196***	0.195***
Exports to turnover ratio	t	0.006	0.009	0.012	0.012
	t+1	0.011	0.014	0.024*	0.026
	t+2	0.021	0.028*	0.028**	0.034**
Number of treated		382	339	376	326
Number of control		670	596	668	570

Controlling for investments size EU funding leads to a:

- larger increase in labour productivity and TFP in the third year
- larger increase in wages and the number of employees

DECOMPOSITION OF PRIVATE FINANCING INTO LOANS AND OWN RESOURCES

Difference-in-difference (DiD) for various sources of capital financing (5 groups of K/L growth; caliper=0.05)

		ERDF financing vs predominantly loans	ERDF financing vs predominantly own resources
Log(TFP)	t	0.027	0.003
	t+1	0.043	0.063
	t+2	0.124	0.156*
Log(labour productivity)	t	0.002	-0.008
	t+1	-0.014	0.035
	t+2	0.064	0.110
Log(wage)	t	0.000	-0.009
	t+1	0.051	0.046
	t+2	0.074	0.070**
Log(capital to labor ratio)	t	0.044	0.052
	t+1	0.069	0.034
	t+2	0.083*	0.002
Log(employment)	t	0.127***	0.090***
	t+1	0.216***	0.132***
	t+2	0.294***	0.202***
Exports to turnover ratio	t	0.020	0.028***
	t+1	0.021	0.035**
	t+2	0.022	0.039**
Number of treated		276	322
Number of control		411	575

CONCLUSIONS

- ✓ EU support is clearly associated with an increase in company's size and capital, bringing about larger output and sales
- ✓ The effect on productivity is not clearly evident in the first two periods, while companies manage to catch up starting from period 3
- ✓ This effect on productivity is larger for initially bigger and less productive firms; the opposite is the case for the effect on employment
- ✓ These findings point out at lags in capital utilization due to several possible reasons:
 - knowledge gaps
 - insufficient local market size
 - lack of export expansion
- ✓ When firms undertake investment activities using EU funds they tend to grow bigger as compared to privately financed investments.