Buy and fire? Evidence from European mergers

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Abstract

This paper provides a systematic analysis on the employment effects after merger and acquisition activities for a sample of European production firms. Rather than taking the perspective of the acquired firm, which has been extensively addressed in previous research, this paper focuses on the acquiring firm. At hand with a data set covering roughly 200.000 firms between 2003-2010 we apply propensity score matching methods to evaluate post-merger effects. Our results suggest that companies that have been acquiring other firms show a higher employment growth rate than their counterparts. This result holds by splitting our data in several sub samples (small and medium-sized firms, national takeovers).

JEL Codes: C, G, L

Keywords: Merger and acquisition evaluation, propensity score matching, employment effects.

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1 Introduction

This paper provides a systematic analysis on the employment effects after merger and acquisition (M&A) activities for a sample of European production firms between 2003 and 2010. Rather than taking the perspective of the acquired firm, which has been extensively addressed in previous research (see, e.g., Oberhofer, 2012) this paper focuses on the acquiring firm. This is not only of interest for the regarding firms but also for policy makers, as, regarding to foreign trade theory, such activities also concern domestic jobs. Merger effects on acquiring firms are not obvious ex ante for the following reasons: on the one hand, acquiring firms might exploit short run economies of scale by reducing overall employment (see, e.g., Gugler and Siebert, 2007); on the other hand, they want to strenghten their position in the acquired market, and increase overall employment. We construct a data set consisting of both the Bureau van Dijk´s ZEPHYR (Comprehensive M&A data) and Amadeus (balance sheet data) company information. Our sample covers roughly 200,000 firms and around 1,500 successful mergers. In order to evaluate post-merger effects we use propensity score matching (PSM) techniques. This allows us to construct a quasi-experimental setting comparing treated (acquiring firms) versus non-treated firms (non-acquiring firms). In a first step, we run a probability model in order to estimate the determinants for receiving the treatment (acquiring another company). Given these propensity scores, we compare in a second step the outcomes for the firms that have been acquiring or not, respectively. The resulting average treatment effect measures the effect of the treated firm compared to a (hypothetical) situation in which this firm would not have received the treatment. In addition, this approach also allows us to overcome the missing data problem and the self-selection into treatment. Our results suggest that companies that have been acquiring other firms show a higher employment growth rate (around 2%) than their counterparts with the same probability for receiving the treatment. For robustness checks, we divide our sample in different sub-groups according to firm size. Also in this setting, the results do not vary much but suggest that small and medium sized firms (up to 250 employees) benefit more than large firms (>250 employees).

2 Empirical strategy

The central interes of this paper is to identify the effects of M&As on employment in overtaking firms, taking into account their observable firm specific characteristics. The empirical challenge here is to tackle this type of endogeneity in acquisition probabilities. Hence, propensity score matching seems most suited to analyse this research question as

we, firstly, have enough observations to construct a reliable control group, and, secondly, have sufficient information on observable firm-specific characteristics to estimat a selection equation (endogeneous selection into treatment). In our case the treatment is a situation in which a firm (i) increases its existing shares of another firm to at least 50% or (ii) buys at least 50% of a firm with respect to observable characteristics. We then want to analyze the effects of the acquiror's employment growth rate. In detail, we calculate the the mean growth rate of the following two years after a succesful merger. We conduct the propensity score matching as follows: first, we run a Probit model given the observable firm specific characteristics. We take the same variables to run this estimation like Oberhofer (2012). The resulting propensity score gives us predictions for the likelihood of acquiring another firm. Second, the change in employment of the acquiring firm is compared to those firms that have the same (most similar) propensity (based on the Probit model) score for investing in a firm but have not done so (i.e. control group). The effect we are intested in is the average treatment effect on the treated, in our case the mean employment growth rate for the two years after a succesful M&A.
Firstly we specify a binary choice model in order to predict a firm's probability to become an acquiror, based on the observable firm characteristics (see, e.g., Heckman et al. 1997)

$$A^*_{it} = \Phi(\mathbf{x}'_{i,t-1}\beta) \tag{1}$$

$$A_{it} = \begin{cases} 1 \text{ if } A^*_{it} < 0 \\ 0 \text{ otherwise} \end{cases} \tag{2}$$

where i indicates the i^{th} firm, t beeing a time index. A^*_{it} is the variable that captures a firm's propability to become an acquiror. Furthermore, the observed outcome is represented by A and takes the value of 1 if A^*_{it} exceeds the zero threshold, and zero otherwise. $\mathbf{x}$ is a vector ofvariable that includes our explanatory variables measured in the period prior to the merger, with β beeing the corresponding parameter vector. Φ denotes the cdf of a normal distribution, as we estimate a Probit model. The explanatory variables we use are discussed below. As stated above, the interest of this paper is to measure the impact of M&A activitiesn o the mergers' employment growth rate. We therefore denote $\tilde{w}^T_{i,\frac{1}{2}(t_{+1}+t_{+2})}$ as the mean employmentate growth of the two years following a merger or acquisition. The corresponding situation in which a firm has not acquired another company is therefore given by $\tilde{w}^C_{i,\frac{1}{2}(t_{+1}+t_{+2})}$. Comparing these two situations results in the average treatment effect (τ_{ATT} (see, e.g., Wooldridge 2010)

$$\tau_{ATT} = E(\tilde{w}^T_{i,\frac{1}{2}(t_{+1}+t_{+2})} - \tilde{w}^C_{i,\frac{1}{2}(t_{+1}+t_{+2})} | A_{it} = 1). \tag{3}$$

As we are only able to observe on status (either a firm becomes an acquiror or not), we need an appropriate control group of non-acquiring firms for this counterfactual. In order to do so, we estimate Eq. (1) to gain each firm's probability of becoming an acquiror in t (i.e., the propensity score). To proxy $\tilde{w}^{C}_{i,\frac{1}{2}(t_{+1}+t_{+2})}$ we use the employment growth rate of the non-acquiring firms with the same (or most similar) propensity score to a firm in the treatment group. In our baseline treatment, we use the average of the three nearest neighbors as the appropriate comparison firm. In our robustness analysis, we also conduct nearest neigbor (1) and kernel matching techniques respectively. The estimation of the average treatment effect requires the following assumption to hold: we need the common support assumption stating that all acquiring firms countries have a counterpart in the non-treated population. This assumption can be verified with a test proposed by Rosenbaum and Rubin (1985). In the results's section, we report some balancing property tests which commonly point to a considerable bias reduction indicating that the difference between both firm types is reduced substantially after matching.

3 Data and descriptives

To construct the data sed used in this paper we had to merge two data sources. First, we use the Bureau van Dijk's Zephyr database, that provides us with detailled information on M&A activities. We know the exact date of the takeover, how many shares have been acquired and have already been in stock , respectively. We merge these information with the AMADEUS database, also provided by the Bureau van Dijk. The AMADEUS data set provides us with detailled firm specific information and their main sector (given their NACE code). Each firm that appears in both sources has the same uniquely identifiable id which allows us to merge them exactly. As we are interested in the employment effect of the buying firm and not on the company network as a whole, we run our estimations on onconsolidated accounts (both acqhired and non-acquired) only. To gain useful results, we have to make some restrictions on the data at hand: (i) we exclude multiple takeovers over years (multiple takeovers within a year are cummulated and treated like a single takeover (ii) we only include firms that have all relevant information over the years (iii) we exclude firms with extreme outliers and companies that have implausible values [1]. For our baseline treatment, this leaves us with a total sum of 1,012 treated units and more than sufficient number of control firms (161,894).
Figure 1 and Table 1 show the distribution of acquiring firms over Europe between 2003

[1] we exclude firms with negative employment stock, firms with only one employee or more than 100,000 employees or with implausible growth rate (over 5000% per year)

- 2010. The majority of these firms are located in Spain (106), France (242) and Great Britain (205) followed by Belgium, Germany and Italy.

Table 1: List of treatment countries

Country	Frequency	Percent
Austria	11	1.09
Bosnia and Herzegovina	2	0.20
Belgium	54	5.34
Switzerland	1	0.10
Czech Republic	37	3.66
Germany	75	7.41
Spain	106	10.47
Finland	68	6.72
France	242	23.91
Great Britain	205	20.26
Hungary	2	0.20
Ireland	4	0.40
Italy	79	7.81
Netherlands	7	0.69
Norway	25	2.47
Poland	14	1.38
Portugal	13	1.28
Romania	15	1.48
Serbia	10	0.99
Sweden	29	2.87
Slovenia	7	0.69
Slovakia	6	0.59
Total	1,012	100.00

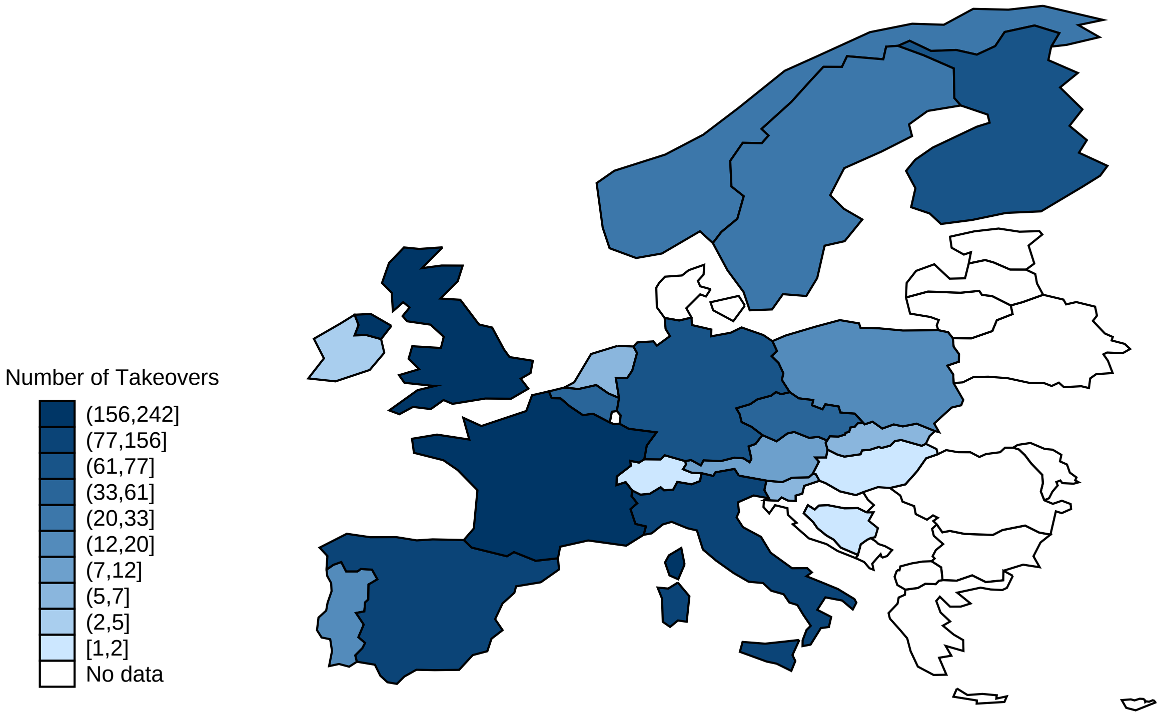

Figure 1: Data coverage

In figure 2, we add the deal values. This graphic shows on the horizontal axis the deal values (in logs) and on the vertical axis the number of takeovers that have taken place over the time period between 2003 and 2010. The size of the bubbles refers to the mean firm size (measured in number of employees). It can be seen that rather small firms (e.g. located in France (FR) or Great Britain (GB) show a high rate transactions, whereas for example firms located in eastern Europe (Slovenia, Slovakia, Czech Republic) are bigger but buy less often.

In Table 2 we show some descriptive statistics for the variables used in our analysis. For our baseline treatment, we define a succesful merger as a final share after M&A activities of at least 50%. This leaves us with 1,012 acquirors that have 3 and almost 27,000 employees with a mean employment stock of 361. These firms are about 24 years old and are therefore on average bigger and slightly older than the control firms.

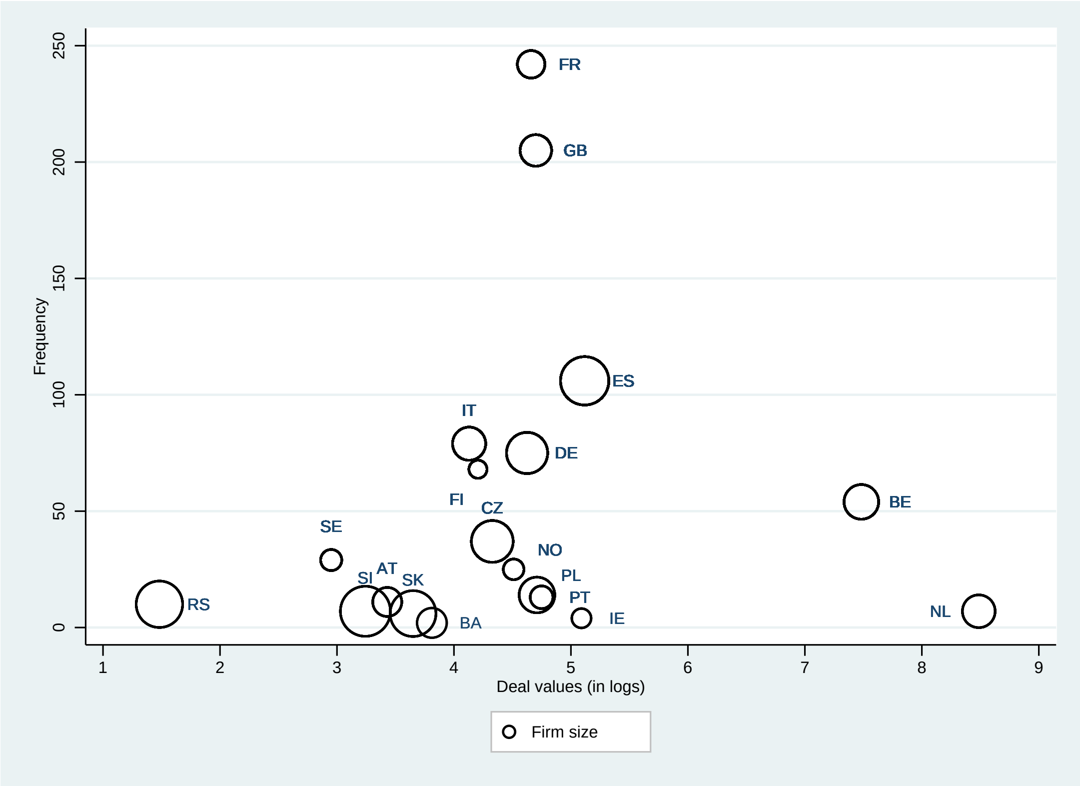

Figure 2: Data coverage

Moreover, the acquiring firms are more productive (productivity is measured as value added per employee) and have a slightly better return on assets and a almost identical capital intensity (total assets per employee). Small and medium-sized firms[2] are even more productive, capital intense and have a better return on assets whilst beeing slightly younger. Furlan, Oberhofer and Winner (2014) amongst others show, that one loses information by focusing on a single threshold (in our baseline treatment: acquiring at least 50% of all shares). We therefore ad two more samples, where we define a succesful merger by acquiring at least 25% and 75% respectively. Both these sub-groups are bigger than the control firms, more productive, older and have a higher capital intensity. What can be seen for all samples of acquiring firms ist that the have a significant higher employment growht rate (between 0.016 and 0.026) compared to the ones of the control firms (0.07).

[2]We use the definition for small and medium-sized enterprises as defined in EU Law (Official Journal of the European Union, C118/5)

Table 2: Summary Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
M&A acquirors (Baseline treatment)					
Employment growth	1,012	0.016	0.156	-1.354	2.037
Employees (log)	1,012	4.833	1.288	1.099	10.203
Employees	1,012	361.702	1,244.714	3	26,981
Productivity	1,012	4.156	0.715	1.652	9.199
Firm age	1,012	23.900	19.547	2	104
Return on assets	1,012	−2.454	1.004	-6.259	-0.287
Capital intensity	1,012	5.032	0.939	1.767	11.280
Final stake	1,012	94.725	12.847	50	100
M&A acquirors (Small- and medium-sized firms)					
Employment growth	750	0.026	0.162	-1.354	2.037
Employees (log)	750	4.253	0.834	1.099	5.521
Employees	750	93.484	62.858	3	250
Productivity	750	4.206	0.687	1.652	9.199
Firm age	750	22.731	17.449	2	104
Return on assets	750	−2.380	1.016	-6.259	-0.287
Capital intensity	750	5.059	0.925	2.953	11.280
Final stake	750	94.435	12.020	50	100
M&A acquirors (25% takeovers)					
Employment growth	1,085	0.016	0.159	-1.354	2.037
Employees (log)	1,085	4.885	1.364	1.099	11.106
Employees	1,085	486.794	2486.640	3	66,567
Productivity	1,085	4.168	0.729	1.652	9.199
Firm age	1,085	23.904	19.721	2	104
Return on assets	1,085	−2.478	1.008	-6.259	-0.287
Capital intensity	1,085	5.070	0.969	1.767	11.280
Final stake	1,085	90.801	19.274	25	100
M&A acquirors (75% takeovers)					
Employment growth	905	0.019	0.150	-1.333	2.037
Employees (log)	905	4.812	1.225	1.099	10.203
Employees	905	323.814	1,181.121	3	26,981
Productivity	905	4.164	0.666	1.652	7.224
Firm age	905	23.967	19.587	2	104
Return on assets	905	−2.426	1.006	-6.259	-0.287
Capital intensity	905	5.017	0.902	1.767	9.472
Final stake	905	98.769	4.623	75	100
Control firms					
Employment growth	161,894	0.007	0.161	-3.462	3.543
Employees (log)	161,894	4.205	1.420	0.693	11.511
Employees	161,894	284.274	2,038.840	2	99,837
Productivity	161,894	4.068	0.787	-2.853	11.481
Firm age	161,894	23.139	18.130	1	105
Return on assets	161,894	−2.696	0.986	-6.307	1.312
Capital intensity	161,894	5.056	1.078	-2.159	13.447

4 Estimation results

The following table shows the estimation results for our selectin equation, explaining the probability for a firm to become an acquiror. Note again, that in our baseline treatment a succesful merger is defined as a increase of the final stake to at least 50%. The first column refers to our baseline specification while the other three offer first robustness analyses. In particular, in column 2, we only allow small- and medium-sized firms (up to 250 employees) to become acquirors. In column 3 and 4 we use a different definition for our treatment, namely that 25% and 75% of all outstanding shares have to be acquired, respectively. What can be seen is, that bigger firms tend to be more likely to become an acquiror. We can also show, that firms with a higher level of productivity and return on assets are more likely to become active regarding M&A activities. Furthermore, we find that younger firms and less capital intense companies show a higher propability to become an acquiror. All the effects mentioned above are quite robust in comparison to our different treatment definitions. The magnitude of the parameter changes only slighty, whereas significance and sign stay the same. Moreover, we control for time and industry effects (on a 2-digit nace code level). With a total number of 162,906 observations for the baseline treatment we are confident to have a sufficient number of control firms to conduct the next step of the propensity score matching. Naturally, for our first alternative, the number of observations drops, as we only allow companies to be part of the Probit that have up to 250 employees. The fact, that the last two different definitions for a treatment have the same number than in our baseline version is owed to the fact that the number of treated observations decreases 1:1 with the increasing number of control firms.

Table 3: Estimation results for the selection equation (takeover probability)

Variable	**Baseline treatment**	**Small- and medium-sized firms**	**25% takeovers**	**75% takeovers**
Employees	0.110***	0.208***	0.119***	0.107***
	(0.008)	(0.015)	(0.007)	(0.008)
Productivity	0.117***	0.156***	0.108***	0.146***
	(0.031)	(0.037)	(0.030)	(0.033)
Firm age	−0.025*	−0.028*	−0.032**	−0.025*
	(0.014)	(0.017)	(0.014)	(0.015)
Return on assets	0.071***	0.086***	0.067***	0.073***
	(0.015)	(0.017)	(0.014)	(0.015)
Capital intensity	−0.055**	−0.046*	−0.036	−0.078***
	(0.023)	(0.026)	(0.022)	(0.024)
Time effects	*Yes*	*Yes*	*Yes*	*Yes*
Regional effects	*Yes*	*Yes*	*Yes*	*Yes*
Observations	162,906	136,143	162,906	162,906

Notes: Parameter estimates are reported. Parameter estimates of the constant are not reported. Robust standard in parentheses. *,** ,*** denote 10%, 5% and 1% significance levels, respectively. [a]

Consequently, the estimation outcomes of the just described selection equations allow us to predict propensity scores for both acquiring and non-acquiring companies. Subsequently, these predications are used for the construction of the control group of non-acquiring firms. Hereby, it is crucial that the above described common support restriction is imposed and that the balancing property is fulfilled. The former is needed to ensure that all acquiring companies have a relevant counterpart in the non-treated population. With regard to the latter, Table 4 reports balancing property tests for the baseline model with and nearest neighbor matching. Evidently, after matching, both groups of countries (the acquiring ones and their matched counterparts) do not significantly differ with regard to their covariates. Consequently, especially for the baseline definition the matching procedure induces a considerable bias reduction. This implies that observations with the same propensity score have the same distribution of their observable characteristics. Thus, exposure to the treatment is now exogenous (given the included observable characteristics) and the treated and control countries are on average identical.

Table 5 not only reports various ATTs applying our baseline definition of a succesful merger, but also for the already discussed sub-samples. Furthermore, we apply for each sample nearest neighbor, three nearest neighbors and kernel matching. It is worth noting, that the standard errors are obtaine via bootsrapping (100 replications each). The result for our baseline treatment shows, that companies, who decide to buy another firm (in the baseline version: acquisition of at least 50%) show a statistically significant higher

Table 4: Balancing property tests for the baseline model and three nearest neighbor neighbor matching

		Baseline treatment						Small- and medium-sized firms					
		Mean			% reduct	t-test		Mean			% reduct	t-test	
Variable	Sample	Treated	Control	% bias	|bias|	t	p> |t|	Treated	Control	% bias	|bias|	t	p> |t|
Employees	Unmatched	4.6123	4.0966	35.4		20.06	0.000	4.0154	3.6552	34.0		16.53	0.000
	Matched	4.8331	4.8081	1.7	95.1	0.41	0.685	4.2534	4.2854	−3.0	91.1	−0.74	0.461
Productivity	Unmatched	3.9811	3.9433	4.0		1.94	0.053	4.0475	3.9558	9.9		4.14	0.000
	Matched	4.1558	4.1724	−1.7	56.0	−0.49	0.621	4.2059	4.1630	4.6	53.3	1.12	0.261
Firm age	Unmatched	2.7943	2.7554	4.2		2.39	0.017	2.7525	2.7271	2.8		1.38	0.168
	Matched	2.8656	2.8739	−0.9	78.7	−0.23	0.818	2.8452	2.852	−0.7	73.5	−0.16	0.871
Return on assets	Unmatched	−2.4287	−2.6989	25.9		11.53	0.000	−2.3711	−2.6904	30.3		11.72	0.000
	Matched	−2.4537	−2.4344	−1.8	92.9	−0.46	0.649	−2.3801	−2.4134	3.2	89.6	0.67	0.500
Capital intensity	Unmatched	5.0592	4.9759	6.7		3.70	0.000	5.1289	4.9887	11.2		5.39	0.000
	Matched	5.0325	5.0487	−1.3	80.6	−0.36	0.718	5.0590	5.0276	2.5	77.5	0.61	0.541

		25% takeovers						75% takeovers					
		Mean			% reduct	t-test		Mean			% reduct	t-test	
Variable	Sample	Treated	Control	% bias	|bias|	t	p> |t|	Treated	Control	% bias	|bias|	t	p> |t|
Employees	Unmatched	4.6579	4.0961	38.0		22.57	0.000	4.7018	4.0957	40.5		24.84	0.000
	Matched	4.8836	4.8680	1.1	97.2	0.26	0.797	4.9455	4.8075	9.2	77.2	2.16	0.031
Productivity	Unmatched	3.9920	3.9433	5.1		2.59	0.010	3.9990	3.9432	5.9		3.02	0.002
	Matched	4.1680	4.1657	0.2	95.4	0.07	0.946	4.1744	4.1506	2.5	57.5	0.71	0.479
Firm age	Unmatched	2.7832	2.7555	3.0		1.76	0.078	2.7828	2.7555	2.9		1.77	0.077
	Matched	2.8581	2.8458	1.3	55.8	0.35	0.729	2.8600	2.8696	−1.0	65.1	−0.26	0.798
Return on assets	Unmatched	−2.4577	−2.6988	23.2		10.67	0.000	−2.4780	−2.6987	21.2		9.97	0.000
	Matched	−2.4801	−2.4633	−1.6	93.0	−0.41	0.685	−2.4975	−2.4171	−7.5	64.4	−1.84	0.066
Capital intensity	Unmatched	5.0822	4.9758	8.6		4.90	0.000	5.1019	4.9756	10.2		5.93	0.000
	Matched	5.0713	5.0587	1.0	88.2	0.29	0.775	5.0873	4.9955	7.4	27.4	2.05	0.041

employment growth rate compared to a situation in which they would have not done so. The effect is around 1% for the mean employment growth of w following two years after the acquisiton. If we take a look at only small- to medium-sized firms, one can see that the effect becomes even bigger (around 2%) and also holds for different definitions of the treatment, where the average treatment effect is around 1.5%. The effects are always highly statistical significant. Furthermore, we construct a sub-sample for only inter-country mergers. The effect is still significant at around 1.5%[3]

Table 5: Results for employment growth rates

	ATT	**Std. Err.**
Baseline treatment		
Nearest Neighbour	0.010***	(0.004)
Neighbour 3	0.015***	(0.001)
Kernel	0.010**	(0.003)
Small- and medium-sized firms		
Nearest Neighbour	0.021***	(0.004)
Neighbour 3	0.022***	(0.006)
Kernel	0.014***	(0.004)
25% takeovers		
Nearest Neighbour	0.016***	(0.001)
Neighbour 3	0.013**	(0.005)
Kernel	0.012**	(0.004)
75% takeovers		
Nearest Neighbour	0.017***	(0.004)
Neighbour 3	0.018**	(0.006)
Kernel	0.012***	(0.004)

Notes: The dependent variable *employment growth rate* equals one if a company acquires another firm and zero otherwise. Bootstrapped standard errors with 100 replications reported. *,** ,*** denote 10%, 5% and 1% significance levels, respectively.

5 Conclusion

In this paper, we provide a systematic analysis on the employment effect after M&A activities for a sample of European firms between 2003 and 2010. Rather than taking the perspective of the acquired firm, this paper focuses on the acquiring firm. This is not only of interest for the regarding firms themselves but also for policymakers. We apply PSM techniques in order to evaluate these post-merger effects, comparing treated (acquiring) to non-treated (non-acquiring) firms. We find that acquiring companies have a statistically significant higher employment growth rate compared to the (hypothetical)

[3]the results are not reportet here but are available by the author upon request

situation in which they have not acquired another firm. For robustness checks, we divide our sample in different sub-groups according to firm size. Also in this setting, the results do not vary much but suggest that small and medium sized firms (up to 250 employees) benefit more than large firms (>250 employees).

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