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Employment in family firms: Less but safe? Analyzing labor demand of German family firms with a treatment model for panel data

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Abstract*

This paper analyzes the differences in labor demand and labor turnover between family and non-family firms. The majority of firms in modern economies and, therefore, also in Germany are family controlled. These firms seem to have better employment performance than non-family controlled companies. Therefore, this study applies a treatment model for panel data using family firms as a treatment indicator. Moreover, a propensity score estimation is introduced to the model to control for selectivity. The results of the estimations indicate that labor demand is possibly larger because of family members joining the firms as extra employees. Moreover, labor turnover is lower, thus supporting the assumption that family firms offer some kind of implicit contracts to their employees and are more loss averse than other establishments. However, evidence of these results for establishments with 20 or more employees is generally weaker, indicating that the differences between both types of firms decrease with firm size.

Zusammenfassung

Die vorliegende Arbeit untersucht Unterschiede in der Arbeitsnachfrage von Familienbetrieben zu anderen Firmen. Wie in anderen modernen Industriegesellschaften auch sind die meisten deutschen Unternehmen immer noch in Familienbesitz und haben daher eine große Bedeutung für den Arbeitsmarkt. Um mögliche Unterschiede in der Nachfrage nach Arbeit darzustellen, die auf die Eigentumsverhältnisse zurückzuführen sind, werden Pandeldaten für eine Kausalanalyse verwendet, wie sie aus der Wirkungs- bzw. Evaluationsforschung bekannt ist. Die Ergebnisse deuten darauf hin, dass Familienbetrieb einen höheren Beschäftigungsstand aufweisen. Dies ist aber möglicherweise nur auf Familienmitglieder zurückzuführen, die zusätzlich beschäftigt werden. Zusätzlich scheint die Fluktuation in Betrieben in Familienbesitz kleiner zu sein. Dies kann ein Hinweis auf Implizite Kontrakte und eine größere Verlustaversion in Familienunternehmen sein. Diese Zusammenhänge werden jedoch kleiner bzw. statistisch unsicher, wenn größere Betriebe mit 20 oder mehr Beschäftigten betrachtet werden. Daher scheinen sich die Unterschiede in der Arbeitsnachfrage zwischen Familienbetrieben und anderen Firmen mit der Unternehmensgröße zu verringern.

JEL-classification: J23, D22, G32, C21, C23
Keywords: Labor Demand, Family Firms, Firm Size, Treatment Model, Panel Data

* This study used data of the IAB Establishment Panel from the Institute for Employment Research (IAB), waves 2001 to 2014. Data access was provided via on-site use at the Research Data Centre (FDZ) of the German Federal Employment Agency (BA) at the Institute for Employment Research (IAB) and/or remote data access.

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1. Introduction

Usually, family businesses play a major role in economies. This is true both for less developed countries with mainly rural economies and for industrialized nations. In Germany, families control about 90% of the privately owned companies. The share of sales for family owned companies, at a national economy level, exceeds 40% of all sales for private companies, and their share of employment is larger than 50% of the total workforce (Klein 2000). From 2006 to 2012, the 500 top family businesses expanded their domestic workforce from 2.97 to 3.29 million workers. At the same time, the 27 German DAX companies that are not controlled by families saw a reduction of employment from 1.5 to 1.3 million (Stiftung Familienunternehmen 2015[1]). These numbers indicate that the behavior of family firms is of a particular interest for economies and therefore should be the subject of economic analysis.

From the previous figures, where family firms increased employment and other companies did not, one can assume that labor demand and possibly labor turnover of family businesses differ from those of non-family firms. Therefore, the subsequent research analyzes both variables in the context of family firms. In particular, panel data is used to derive a treatment effect of being a family firm or not. In addition, we cannot reject the assumption of selectivity. Therefore, propensity score estimates are used to control for this possible non-random assignment process.

Initial estimation results support the hypothesis that family firms offer implicit employment contracts in which job security is related to lower labor turnover. In addition, there is some support that employment in family firms is larger, but only because family members join the establishment as extra workers. However, these results only hold for small firms. If the analysis is restricted to establishments with 20 or more employees, most of the differences in labor demand and labor turnover disappear. Therefore, it seems that only small family firms show distinct behavior in labor demand.

The paper is organized as follows. The next section presents the results of previous research and the hypotheses about labor demand in family firms. Section III constitutes the treatment model, and Section IV introduces the establishment data from Germany. The results of the empirical analysis are discussed in Section V. Finally, the outcome is summarized in Section VI.

[1] An English summary of the study is available at http:// www.familienunternehmen.de/en/data-numbers-facts.

2. Previous Research

Some previous studies have analyzed the influence of the ownership structure on employment. Much of the existing research relies on the assumption that, next to the assumption of profit maximization, owners and executives from an owner family are identified by the actions of a family firm. This probably has some consequences on the behavior of the entities (cf. Anderson & Reeb 2003, Bandiera, Guiso et al. 2015, Bassanini, Caroli, et al. 2013, Block 2010, D'Aurizio & Romano 2013, Sraer & Thesmar 2007). These studies argued that family firms also have noneconomic targets such as the accumulation of so-called socioemotional wealth (Miller & Le Breton-Miller 2006). This concept contains aspects like identity, family influence on the firm and inheritance of the company to their descendants (Gomez-Mejia et al. 2007). Therefore, family businesses probably have longer time horizons related to other entities and are more cautious in changing their employment. This also has consequences for the firms' management. Most of the board members (about 80%) and CEOs (around 55%) in large US family firms are non-family managers (Anderson & Reeb 2003). In Germany, 56% of German family firms have at least one executive from outside the owner family (Klein 2000). Consequently, family firms experience a conflict between the abilities and willingness of family members to manage the firms and the amount of socioemotional wealth when the owners hire executives from outside the family.

Two other aspects that influence labor demand in family firms are the job security of the employees and the loss aversion of executives from the owner family. The former is often related to implicit employment contracts in which job security is offered implicitly in return for lower wages, the latter implying a faster adjustment of employment back to equilibrium after an economic shock. The results of Sraer and Thesmar (2007) and Bassanini, Caroli et al. (2013) support the idea that family firms offer implicit contracts to their employees in return for lower wages among French firms. This result is possibly due to family workers, i.e., members of the family working in the establishment, as in small- and medium-sized family firms a large part of the employment belongs to this kind of workers (Block, Millan et al. 2015). In addition, Bjuggren (2015) came to the same conclusion using Swedish microdata. Moreover, he, Lee (2006) and Block (2010) identified that turnover and employment is less volatile within family firms and, therefore, they are less likely to reduce employment during an economic shock.

Some studies have also concluded that loss aversion drives the behavior of family firms rather than risk aversion. This could lead to a kind of a self-adjusting device so that the firm stays closer to its optimal labor demand and minimizes fluctuations (Choudhary & Levine 2010). Block (2011) and Chrisman, Memili & Misra (2014) found that family managers need larger incentives to increase performance, as their loss aversion is larger compared to other executives. If these differences lead to a lower performance compared to non-family firms, then they possibly have a negative influence on the firms' labor demand. If the firms pay lower wages compared to other entities, then they are, all other things being equal, more likely to show higher profits. Then, their risk of realizing losses is lower and they do not need to adjust their employment as much as other firms probably do, unless the family firms face the risk of bankruptcy. Contrary to this argument, a family firm could be more willing to accept below-target performance to avoid the loss of socioemotional wealth that includes the ability of the owner family to lead the firm and the long-run existence of the firm. Therefore, family firms could be less anxious to adjust employment when a shock occurs and socioemotional wealth is at risk (Bjuggren 2015).

Family firms of different sizes may follow different economic and non-economic goals, as agency costs or costs of keeping socioemotional wealth probably increase as the firm size grows. According to the need for additional managerial skills in larger companies, family firms have to calculate the costs and benefits of hiring external managers. Fang, Rudolph et al. (2016) concluded that growing firms profit when they hire executives from outside the family, as the benefits increase faster than the costs that arise. Miller, Minichilli & Corbetta (2013) supported this result, finding that family managers outperform external executives in small firms with more concentrated ownership, while the opposite occurs when large firms with a dispersed ownership are observed. According to these results, the firms' economic behavior differs with firm size. The findings of Kölling (2016) support the assumption that large family firms do not act differently than other companies, while it is not possible to reject the assumption that small family firms show a larger loss aversion or offer implicit contracts.

The overview of previous studies led to some hypotheses about differences in labor demand between family and non-family firms. First, if family firms offer implicit contracts and their behavior is influenced by loss aversion, then labor turnover should be lower compared to other establishments. Second, larger family firms have a higher risk of a decreasing socioemotional wealth, and the management abilities of executives from the owner family in these companies are possibly smaller. Therefore, labor demand could be lower. On the other side, if family firms pay lower wages because of implicit contracts, they could realize higher profits and larger employment. In addition, family members could possibly join the firm, creating additional employment. Both are reasons for a larger employment in family firms. To analyze these hypotheses, we apply a treatment model for panel data that is based in principle on a difference-in-difference approach. The next section introduces the model used for the investigation.

3. Study Design

The study was designed to analyze the impact of family ownership on labor demand. In this context, we accounted for the panel structure of the dataset. The fundamental problem of the analysis is that we cannot measure the causal effect of a treatment on the treated, since it is not possible to be a participant and a non-participant in a treatment at the same time (cp. Roy 1951, Rubin 1974). This fundamental evaluation problem is frequently solved using the Roy-Rubin model or the model of potential outcomes. When empirically studying a participation effect, it is usually assumed that, taking into consideration certain observable variables x_{it}, participants and non-participants would have developed in the same way if the treatment had not been applied. This assumption is frequently referred to as the conditional independence assumption (CIA) of unconfoundedness (Wooldridge 2002):

$$E(Y_{it}(0)|\, d_{it} = 1, x_{it}) = E(Y_{it}(0)|\, d_{it} = 0, x_{it}) \tag{1}$$

where $Y_{it}(0)$ is the outcome for firm i in period t if the entity is not a family firm (0), d is the indicator of participation ($d_{it} = 1$) or non-participation ($d_{it} = 0$) and x_{it} is the observed covariate under consideration. In addition to the selectivity of participation, unobserved heterogeneities c_i, too, can influence the effect of the treatment. This leads to a reformulation of equation (1):

$$E(Y_{it}(0)|\, d_{it} = 1, x_{it}, c_i) = E(Y_{it}(0)|\, d_{it} = 0, x_{it}, c_i) \tag{1a}$$

As the difference in the outcome between family and non-family firms is defined as the treatment effect τ_t, we can also assume:

$$E(Yit(1)|\, dit = 1, xit, ci) = E(Yit(0)|\, dit = 0, xit, ci) + \tau t \tag{2}$$

The observed value of y_{it} is given by:

$$Y_{it} = \begin{cases} Y_{it}(0) \text{ if } d = 0 \\ Y_{it}(1) \text{ if } d = 1 \end{cases} \tag{3}$$

or

$$Y_{it} = (1 - d_{it}) \cdot Y_{it}(0) + d_{it} \cdot Y_{it}(1) = Y_{it}(0) + d_{it} \cdot (Y_{it}(1) - Y_{it}(0)) \tag{4}$$

Replacing Y_{it} by its expected values, assuming a linear model for $Y_{it}(0) = \alpha_0 + \alpha_1 \cdot t + \beta_i \cdot x_{it} + c_i$ and using the relationship in equation (2), equation (4) becomes:

$$E(Y_{it}|\, d_{it}, x_{it}, c_i) = \alpha_0 + \alpha_1 \cdot t + \beta_i \cdot x_{it} + c_i + \tau_t \cdot d_{it} \tag{5}$$

Taking first difference to equation (5) and assuming that the treatment occurs between t_0 and t_1, i.e., τ_0 is zero:

$$E(\Delta Y_{it}|\, d_{it}, x_{it}, c_i) = \alpha_1 + \beta_i \cdot \Delta x_{it} + \tau_t \cdot d_{it} \tag{6}$$

or

$$\Delta Y_{it} = \alpha_1 + \beta_i \cdot \Delta x_{it} + \tau_t \cdot d_{it} + \Delta u_{it} \tag{6a}$$

This expression is equal to the usual difference-in-differences model in first differences (FD) when there are repeated observations for two periods (Imbens & Wooldridge 2009). Equation (6) supposes that one can use this model without loss of efficiency. However, this model does not use all information of the panel data. Wooldridge (2002) proposed a correlated random coefficient model (CRCM),

where the treatment effect also depends on heterogeneity among the firm c_i. In particular, he assumes the following model:

$$E(Y_{it}(1)|\, d_{it} = 1, x_{it}, c_i) - E(Y_{it}(0)|\, d_{it} = 0, x_{it}, c_i) = \tau_t + a_i(c_i) + \delta(x_{it} - E(x_i)) \quad (7)$$

The variable a_i is a function of c_i with $E(a_i) = 0$. Putting equation (7) into equation (5) and assuming that the treatment effect does not vary over time, so that τ_t is equal to τ, yields:

$$E(Y_{it}|\, d_{it}, x_{it}, c_i) = \alpha_0 + \alpha_1 \cdot t + \beta_i \cdot x_{it} + c_i + (\tau + a_i)d_{it} + \delta(x_{it} - E(x_i))d_{it} \quad (8)$$

If $E(a_i) = 0$ holds, the subsequent empirical model could be estimated with a fixed effects estimation:

$$Y_{it} = \alpha_0 + \alpha_1 \cdot t + \beta_i \cdot x_{it} + c_i + \tau \cdot d_{it} + \delta(x_{it} - \bar{x}_i)d_{it} + u_{it} \quad (9)$$

To test whether $E(a_i)$ is zero, Imbens and Wooldridge (2014) supposed a test variable was based on a generalized formulation for $E(a_i)$. In particular, they assumed:

$$E(a_i) = E(a_i|d_{i1}, \dots, d_{iT}) = E(a_i|\bar{d}_i) = \rho \cdot (\bar{d}_i - \bar{d}) \quad (10)$$

where parameter ρ should be zero if $E(a_i) = 0$ and therefore is a useful test to proof if standard fixed effects could be applied to the model. Imputing (10) into (9) yields:

$$Y_{it} = \alpha_0 + \alpha_1 \cdot t + \beta_i \cdot x_{it} + c_i + \tau \cdot d_{it} + \delta(x_{it} - \bar{x}_i)d_{it} + \rho \cdot d_{it}(\bar{d}_i - \bar{d}) + u_{it} \quad (11)$$

The subsequent analysis will use equation (11) to estimate the treatment effects of being a family firm on labor demand. This causal model is also an extension of the standard difference-in-differences model to linear panel data. As the treatment is measured as a dummy indicating whether the establishment is a family firm or not and the dependent variable will be defined as the logarithm of the firms' employment, the treatment effect τ is the relative difference of employment according to the status of being a family owned company. However, before the results of the estimations are presented here, the next section will introduce the panel data for German establishments and give a detailed image of the variables used for the regressions. In addition, the section deals with the problem of selectivity.

4. Data

The Institute for Employment Research of the German Federal Labor Agency has conducted the IAB Establishment Panel since 1993 in western Germany and since 1996 in the former eastern part of Germany. The Panel includes all German establishments with at least one employee covered by social insurance and is based on a stratified random sample of 17 industries, 10 employment size classes, and 16 regions (the Bundesländer) as particular strata (Fischer, Janik et al. 2008, 2009). In the work at hand, the data is restricted to the period from 2001 to 2015, as some of the variables used in the regressions, like year of the firm's founding, have been collected since then. The repeated survey shows a very high response rate of over 70% to 80% for repeatedly participating establishments, respectively. The data is unbalanced as new establishments replace panel mortality through exits and non-response. In total, there are about 16,000 observations each year available for investigations (Fischer, Janik et al. 2008, 2009).

To analyze the labor demand behavior of family firms, two different variables were used as dependent variables. The first directly reflects firms' labor demand and is defined as the logarithm of total employment at the end of June in each particular year. Part-time workers were included in this variable, but only were assigned a value of 0.5. The second variable describes the volatility of labor demand and is defined as the first difference of the previous variable. As we are not interested in differences in increase or decrease of employment but in the fluctuations, this variable is used in absolute values. Because of implicit contracts and a higher loss aversion, we expect less hiring and layoff processes in family firms.

The data contains two different variables indicating the ownership structure. The first is a dummy variable for whether or not the owners work in the establishment. In addition, the IAB establishment panel offers some information about the establishment's board of executives. We used this to calculate an additional dummy variable that equals one when a member of the owner family is also member of the board. While the data surveys the number of owners working in the establishment in every wave of the panel, one can observe the formation of the board since 2007. Therefore, the analysis that deals with the latter information is restricted to eight years from 2007 to 2015, which is the newest data available at the time the investigation was carried out.

Table 1 shows the number and share of family firms in the survey. During the observed period, 73.35% of all establishments surveyed in the panel, representing 158,923 observations, reported that some or all owners were working at the entity. Since 2007, more than three quarters of the establishments stated that the owners managed them. Because the period for these variables was shorter, we also observed a smaller number of data (84,532). From this result, one might consider that both variables exhibit almost the same measure. Therefore, we calculated a correlation coefficient that indicates whether the variables are related to each other. As the observations are dummies, a highly significant spearman's correlation coefficient of about 0.358 was calculated. Therefore, as the size of the correlation is rather low, one should treat the indicators as distinct variables that contain different information about family ownership. In addition, it is not possible to argue that the ownership structure stays constant over the observed time. Between 2001 and 2015, a total number of 7,090 establishments reported that they became a family firm, whereas 7,686 stated that the members of the owner families had left the entities. This means that about 10% of the observations indicated changes in their status over the surveyed period. The figures for the members of family firms acting as business executives were lower. However, this is not only due to the shorter period. Less than 3% of the observations reported a change in status according to this variable. It is not possible to identify the reasons for these differences from the data. In some cases, members of the owner families do not always act as business executives, but rather work as apprentices, trainees or as other workers if they are not the actual owners of the company.

[Table 1 near here]
[Table 2 near here]

According to the theoretical considerations, additional variables were used in the estimations. The IAB Establishment Panel contains information about firms' turnover in the year prior to the interview. Because we used turnover in our investigation, establishments that did not report turnover, in-

cluding banks, insurance companies and public administrations, were excluded from the database. However, we did not use turnover directly, but instead we used the logs of value added where intermediate materials were excluded from turnover. The data also contains information about the wage bill in June of each year, the target month of the survey. Therefore, we included the logarithm of monthly wages per capita in the analysis. In addition, the logarithm of yearly investment was used. Moreover, the nominal values of these variables were discounted by the producer price index. Other variables used were the percentage of female employees, part-timers, temporary workers and workers that are respectively low-skilled or subject to the German social security scheme, ordinal scales of firm profitability and the state of machinery (a dummy for whether the establishment is covered by a collective agreement) and, finally, indicators for particular years. The appendix to this paper presents the descriptive statistics for these principal variables.

The question of whether the price and the quantity of labor and the output were exogenous depends on the assumption that the labor supply is infinitely elastic (i.e., firms take wages as exogenously given and are able to hire as many employees as they demand to maximize profits). Assuming that the model is specified correctly, studies with microdata generally should not have problems with the endogeneity of the mentioned variables (Freier & Steiner 2010, Hamermesh 1993, 68). In the context of the German labor market in the observed period with imperfect competition, rigid wages and high unemployment rates during the observation period still indicate substantial excess in the labor supply despite improvement in the situation on the labor market in recent years. Hence, the assumption of exogeneity according to the supply of labor does not seem to be too unrealistic. However, one has to keep in mind that, at least for the highly skilled, the German labor market situation has changed over the last few years. On the other hand, the observation of a family firm itself may be biased. The decision of a specific ownership structure of a company is possibly influenced by variables that also determine the firms' demand for labor (Kölling 2016). Therefore, one must take care when approaching the selectivity of the data. To overcome the selectivity problem, a matching procedure was applied. Propensity score estimates were used to determine the probability of a firm being a family firm. From the results, weights were calculated to correct the regressions of the theoretical model for selectivity. Therefore, we used bootstrapping with 1,000 repetitions to calculate the standard errors of the parameter. This controls for the variation of the estimated propensity score and for possible serial correlation, respectively heteroscedasticity. The next section contains a detailed description of this procedure. In the following section, we introduce the estimation methods and the particular specification of the regressions.

5. Results of the Empirical Analysis

The outcomes presented in this section were calculated using a matching approach due to the possible selection bias of being a family firm (Kölling 2016). To do so, we used probit estimations to derive an establishment's propensity score of participation as a family firm. The variables for the propensity score estimation were selected according to various aspects. Under ideal conditions, regressors that simultaneously affected participation and the effect of the treatment should be considered for the estimation. The covariates should not be influenced by participation in the treatment or its announcement and should also satisfy the conditional independence assumption (CIA) and the parallel trend assumption conditions (Caliendo & Kopeining 2008; Black & Smith 2004). It is obvious that the quality of the matching procedure determines whether these conditions hold. Therefore, the subsequent section also contains the results of some tests on matching quality. The selection of the exogenous variables for the propensity score estimation follow two criteria: First, they should contribute to reducing the variance of the estimated regression. Second, these variables also do not have a large number of missing values to keep a large number of observed firms in the analysis (Augurzky & Schmidt 2001). Moreover, the propensity scores were estimated individually for the total sample and for firms with at least 20 employees to control for differences according to the establishment size. The results of the propensity score estimations and some additional tests on the quality of the matching procedure are presented in the appendix (Tables A.2 to A.4). From the outcome of the tests we assume in the following the propensity score estimations lead to some reliable regression results.

The results of a simple difference-in-differences model where we do not use the panel structure of the data and additional covariates for the analysis in Tables A.5 and A.6 in the appendix confirm that the use of unmatched samples could produce a misleading outcome. Unmatched data would indicate that the demand for labor is lower in family firms, while the difference is insignificant for larger firms with more than 20 employees. Moreover, this result occurs when family members act as executives in the establishments. If the owners are excluded from the firms' employment, then the outcome for both variables becomes negative, indicating that analysis of both cases is important. In addition, it seems that the differences among family and non-family firms decrease with establishment size. Therefore, we should also take into account firms' employment behavior according to different firm sizes.

The following tables contain the results of a treatment model according to equations (6) and (11). All regressions contain a set of additional covariates as discussed in section IV. Moreover, three versions of the correlated random coefficient model (CRCM) are calculated. Next, for formulation in equation (11), we add a lagged treatment variable in columns (c) and (g) to control whether there are effects that last for more than one period (Autor 2003). It is also possible to split the treatment variable for establishments that become family firms or become non-family firms. This could give some additional insight if the treatment effect belongs to changes in the status of being a family firm. To control whether the effects depend on firm size or the composition of the firms' workforce, the estimates are also conducted with a restricted sample with establishments that employ at least 20 workers, where the members of the owner family are removed from the number of workers. As described before, the dependent variables are the logarithm of employment and the absolute change of logarithm of employment, respectively. Table 3 contains the results of the logarithm of employment when owners working in the establishment is used as a treatment indicator.

[Table 3 near here]

The outcome for the treatment variable in Table 3 is always positive and significant. This indicates that employment in family firms is larger compared to non-family firms. In total, labor demand increases by 4% (column b) when we observe a family firm. For larger establishments with at least 20 employees the difference is about 2% (column f). In addition, this outcome suggests that additional covariates give further insight to the model, as the simple difference-in-differences analysis leads to smaller, respectively insignificant parameters. It seems that the results for the unrestricted data are not always reliable as the test variable is significant. With the exception of column (h), the test variable for the estimations with the restricted sample that only contains entities with at least 20 employees is insignificant. The positive parameter estimates would support the assumption that implicit contracts with

lower wages could create higher profits and, therefore, larger employment. However, this could also indicate that the increase in labor demand is created from the additional employment of family members in these firms. Therefore, the analysis is repeated with the number of workers in the establishments who are not members of the owner family as a dependent variable. Table 4 contains the regression with the restricted sample:

[Table 4 near here]

The results for the CRCM model change completely if the members of the family firms are dropped from the workforce. Now, we find significantly lower employment opportunities for workers if one includes small firms in the investigation, and a statistically insignificant outcome if the sample is restricted to larger firms. Labor demand decreased by more than 15% in all regressions. However, there is some doubt on the outcome, as the test variable is significant in columns (b) and (c). When we split the treatment variable in column (d) for firms that become family firms or non-family firms, respectively, we find similar results. Employment decreases when an establishment becomes a family firm and employment increases when an establishment becomes a non-family firm. However, if we restrict the sample to establishments with at least 20 employees, then the treatment effects vanish completely for the CRCM model, except for the split variable when additional information from the panel structure of the data is used. In addition, the test variable is always insignificant. It seems that family firms do create new jobs, but only for the members of the family itself. Workers who do not belong to the owner family have lower employment opportunities in small firms, while there are no significant differences in larger entities. Tables 5 and 6 contain the parameters for the estimations where executives from the owner family were used as an indicator for family firms. With the exception of column (c) in Table 5, all treatment parameters are insignificant and do not show further insight:

[Table 5 near here]
[Table 6 near here]
[Table 7 near here]
[Table 8 near here]

Tables 7 and 8 show the results of the regressions with the absolute change of employment, again for all employees (Table 7) and for the workforce without members of the owner family (Table 8). The results in both tables are similar. The treatment variable is negative and significant in almost all cases. This supports the assumption that the firms offer implicit contracts with high job security. However, one must be careful with the outcome of the unrestricted samples as the test variables are again significant in both tables. In Table 8, the size of the parameters for the restricted sample is much lower than for the unrestricted sample. However, this is possibly a size effect. The same absolute changes in employment lead to smaller relative changes in larger firms. The outcome of columns (d) and (h) in both tables would indicate that labor turnover increases when the establishment becomes a non-family firm. It is possible that this is due to the replacement of family members in these firms. From columns (c) and (g) in Table 8, one could state that there are some long- or medium-term effects that reduce the negative effect on labor turnover causing differences between family and non-family firms to disappear over time. The next tables show the results with the second treatment variable, when family members act as executives of the firm.

[Table 9 near here]
[Table 10 near here]

The outcome confirms the previous analysis. The effect on job turnover becomes significantly negative for the unrestricted sample and shows insignificant parameter sizes if the estimations are restricted to establishments with at least 20 employees. If the analysis uses a split variable indicating a change in the status of being a family firm, then the parameter for becoming a family firm is positive and significant for the unrestricted sample. If only establishments with at least 20 employees are observed, then the statistical significant effects disappear. In conclusion of the empirical analysis, the

outcome of both indicator variables give some support to the initial hypotheses of this study. Therefore, the results are discussed in the subsequent summary.

6 Summary

This investigation sought to find differences in the labor demand and labor turnover of family and non-family firms. Possible sources of these differences exist because one can assume that family firms not only want to maximize profits, but they also want to maintain or increase the socio-emotional wealth of the company. Moreover, this could lead to a higher loss aversion and offers of implicit employment contracts in these establishments. Following this, family firms possibly have both, a lower labor demand and a lower labor turnover. On the other side, implicit contracts usually contain a lower remuneration. This could lead to higher profits and, therefore, larger employment. In addition, members of the family firm could join the establishment, creating a larger employment level in family firms. Moreover, these differences possibly vanish in larger firms due to a higher professionalization of the firms' behavior and the hiring of external executives.

Therefore, we applied a treatment model for panel data to estimate the treatment effect of family firms on labor demand and labor turnover. In addition, one can assume that there is some selectivity in the observations of family firms. Because of this, we used propensity score estimates of being a family firm to weight the regressions. The empirical results support the propositions. Labor demand seems to be larger for total employment, but only because of members of the family firm working as additional employees in the establishments. The employment opportunities for other workers are more likely to decrease in family firms. In addition, the differences seem to decrease when we observe larger entities.

Looking at labor turnover, the results support the assumption that family firms offer implicit contracts, as the parameters are negative for both the unrestricted and the restricted sample when only establishments with at least 20 employees are observed. From the analysis, it is not clear whether the differences in the parameter sizes are due to a statistical size effect. However, as the estimates are not of the same size, we cannot reject the assumption that only small family firms show different employment behavior. As this empirical result is rather new in the literature, further analysis should prove these results. Future research should also address the different skill levels of employment.

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Tables

Table 1: Number and Share of Establishments Managed by Owners

	Obs.	Share of all Obs.
Owners working in establishment (2001 – 2015)	158,923	73.35%
Managed by owners (2007 – 2015)	84,532	76.65%

Source: IAB Establishment Panel 2001 - 2015.

Table 2: Changes in the status of Family Firms between t and t+1

	Owners working in establishment	Managed by owners (2007-2014)
Never family firm	32,757	16,097
Always family firm	109,437	58,386
Switch to family firm	7,090	1,159
Switch to non-family firm	7,686	1,035
Total no. of obs.	156,970	76,677

Source: IAB Establishment Panel 2001 - 2015.

Table 3: Effects of Family Firms on Labor Demand (Weighted Difference in Difference Model, Indicator: Owners Working in Establishment, Dependent Variable: Log. of Employment)

	(a) First difference of standard DiD (FD)	(b) Correlated random coeffi-cients model (CRCM)	(c) CRCM	(d) CRCM	(e) FD (empl. ≥ 20)	(f) CRCM (empl. ≥ 20)	(g) CRCM (empl. ≥ 20)	(h) CRCM (empl. ≥ 20)
Family firms in t	0.031**	0.042**	0.033**	-	0.002	0.022**	0.023**	-
	(0.003)	(0.009)	(0.006)		(0.003)	(0.001)	(0.006)	
Family firms in t-1	-	-	0.021**	-	-	-	0.014**	-
			(0.004)				(0.004)	
Firms becoming family firms	-	-	-	-0.047**	-	-	-	-0.023*
				(0.010)				(0.009)
Firms becoming non family firms	-	-	-	-0.019**	-	-	-	-0.015*
				(0.007)				(0.007)
Test variable ρ	-	-0.083**	-0.077**	-0.184**	-	0.006	0.016	-0.061**
		(0.028)	(0.017)	(0.040)		(0.020)	(0.020)	(0.017)
"Demeaned" co-variates	-	yes	yes	yes	-	yes	yes	yes
R^2	0.1976	0.9903	0.9914	0.9902	0.1945	0.9871	0.9886	0.9871
Wald-Test χ^2	6,360**	6,028**	6,539**	8,122**	3,053**	4,568 (38)	3,219 (39)	4,008 (39)
(df.)	(12)	(38)	(39)	(39)	(12)			
Obs.	73,584	88,719	64,422	85,747	30,975	37,015	26,098	35,507
(Establ.)		(22,651)	(15,839)	(21,866)		(9,930)	(6,804)	(9,506)

Source: IAB Establishment Panel 2001 - 2015.

Note: The model also includes the following variables: Log. of average wages, log. of value added, log. of investment, share of parttime workers, share of female workers, share of temporary employed, share of employed subject to the social insurance scheme, share of low skilled workers, dummy for coverage by a collective agreement, ordinal variable about the firms' profitability, ordinal variable about the state of machinery and yearly dummies. Standard errors are calculated by bootstrapping with 1000 repetitions. ** and * denote significance at the .01 and .05 levels, respectively. Detailed results available from the author.

Table 4: Effects of Family Firms on Labor Demand (Weighted Difference in Difference Model, Indicator: Owners Working in Establishment, Dependent Variable: Log. of Employment wo. Owners)

	(a) First difference of standard DiD (FD)	(b) Correlated random coeffi-cients model (CRCM)	(c) CRCM	(d) CRCM	(e) FD (empl. ≥ 20)	(f) CRCM (empl. ≥ 20)	(g) CRCM (empl. ≥ 20)	(h) CRCM (empl. ≥ 20)
Family firms in t	-0.159**	-0.238**	-0.184**	-	-0.028**	-0.011	-0.011	-
	(0.004)	(0.039)	(0.008)		(0.003)	(0.007)	(0.006)	
Family firms in t-1	-	-	0.034*	-	-	-	0.014**	-
			(0.004)				(0.004)	
Firms becoming family firms	-	-	-	-0.053**	-	-	-	-0.030**
				(0.007)				(0.015)
Firms becoming non family firms	-	-	-	0.190**	-	-	-	0.019**
				(0.008)				(0.010)
Test variable ρ	-	-0.184**	-0.238**	-0.051	-	-0.033	-0.011	-0.028
		(0.011)	(0.020)	(0.027)		(0.023)	(0.019)	(0.018)
"Demeaned" co-variates	-	yes	yes	yes	-	yes	yes	yes
R^2	0.1687	0.9876	0.9888	0.9875	0.1953	0.9870	0.9885	0.9870
Wald-Test χ^2	6,213**	6559**	6,340**	7,552**	2,971**	3,221**	3,032**	3,985**
(df.)	(12)	(37)	(38)	(38)	(12)	(37)	(38)	(38)
Obs.	67,463	84,822	61,340	84,822	30,970	35,500	25,038	35,500
(Establ.)		(21,619)	(15,083)	(21,619)		(9,512)	(6,547)	(9,512)

Source: IAB Establishment Panel 2001 - 2015.

Note: The model also includes the following variables: Log. of average wages, log. of value added, log. of investment, share of parttime workers, share of female workers, share of temporary employed, share of employed subject to the social insurance scheme, share of low skilled workers, dummy for coverage by a collective agreement, ordinal variable about the firms' profitability, ordinal variable about the state of machinery and yearly dummies. Standard errors are calculated by bootstrapping with 1000 repetitions. ** and * denote significance at the .01 and .05 levels, respectively. Detailed results available from the author.

Table 5: Effects of Family Firms on Labor Demand (Weighted Difference in Difference Model, Indicator: Managed by Executives of the Owner Family, Dependent Variable: Log. of Employment)

	(a) First difference of standard DiD (FD)	(b) Correlated random coeffi-cients model (CRCM)	(c) CRCM	(d) CRCM	(e) FD (empl. ≥ 20)	(f) CRCM (empl. ≥ 20)	(g) CRCM (empl. ≥ 20)	(h) CRCM (empl. ≥ 20)
Family firms in t	0.007	-0.015	-0.020*	-	0.010*	-0.006	-0.005	-
	(0.006)	(0.009)	(0.010)		(0.004)	(0.005)	(0.006)	
Family firms in t-1	-	-	-0.011	-	-	-	-0.008	-
			(0.006)				(0.006)	
Firms becoming family firms	-	-	-	0.017	-	-	-	0.020
				(0.016)				(0.014)
Firms becoming non family firms	-	-	-	0.024*	-	-	-	0.002
				(0.012)				(0.010)
Test variable ρ	-	-0.045	-0.021	0.012	-	-0.027	0.053*	-0.014
		(0.026)	(0.026)	(0.022)		(0.027)	(0.025)	(0.033)
"Demeaned" co-variates	-	yes	yes	yes	-	yes	yes	yes
R^2	0.1342	0.9895	0.9908	0.9902	0.1782	0.9864	0.9881	0.9873
Wald-Test χ^2	3415**	4356**	3139**	3550**	1390**	2299**	1887**	2283**
(df.)	(12)	(32)	(33)	(33)	(12)	(32)	(33)	(33)
Obs.	39,340	52,449	36,620	46,367	15,630	20,516	14,094	18,078
(Establ.)		(15,359)	(10,823)	(14,238)		(6,195)	(4,320)	(5,694)

Source: IAB Establishment Panel 2007 - 2015.

Note: The model also includes the following variables: Log. of average wages, log. of value added, log. of investment, share of parttime workers, share of female workers, share of temporary employed, share of employed subject to the social insurance scheme, share of low skilled workers, dummy for coverage by a collective agreement, ordinal variable about the firms' profitability, ordinal variable about the state of machinery and yearly dummies. Standard errors are calculated by bootstrapping with 1000 repetitions. ** and * denote significance at the .01 and .05 levels, respectively. Detailed results available from the author.

Table 6: Effects of Family Firms on Labor Demand (Weighted Difference in Difference Model, Indicator: Managed by Executives of the Owner Family, Dependent Variable: Log. of Employment wo. Owners)

	(a) First difference of standard DiD (FD)	(b) Correlated random coeffi-cients model (CRCM)	(c) CRCM	(d) CRCM	(e) FD (empl. ≥ 20)	(f) CRCM (empl. ≥ 20)	(g) CRCM (empl. ≥ 20)	(h) CRCM (empl. ≥ 20)
Family firms in t	0.016*	0.003	-0.020	-	0.009*	-0.007	-0.006	-
	(0.007)	(0.011)	(0.012)		(0.004)	(0.005)	(0.006)	
Family firms in t-1	-	-	-0.005	-	-	-	-0.007	-
			(0.007)				(0.005)	
Firms becoming family firms	-	-	-	-0.003	-	-	-	0.020
				(0.016)				(0.015)
Firms becoming non family firms	-	-	-	0.041**	-	-	-	0.002
				(0.013)				(0.011)
Test variable ρ	-	-0.041	-0.022	-0.036	-	-0.026	-0.055*	-0.012
		(0.032)	(0.026)	(0.022)		(0.027)	(0.025)	(0.033)
"Demeaned" co-variates	-	yes	yes	yes	-	yes	yes	yes
R^2	0.0935	0.9867	0.9984	0.9878	0.1753	0.9862	0.9879	0.9870
Wald-Test χ^2	1941**	4573**	2719**	3232**	1487**	2299**	2039**	2283**
(df.)	(12)	(32)	(33)	(33)	(12)	(32)	(33)	(33)
Obs.	39,121	51,834	36,056	45,821	15,626	20,506	14,084	18,070
(Establ.)		(15,197)	(10,645)	(14,073)		(6,196)	(4,319)	(5,695)

Source: IAB Establishment Panel 2007 - 2015.

Note: The model also includes the following variables: Log. of average wages, log. of value added, log. of investment, share of parttime workers, share of female workers, share of temporary employed, share of employed subject to the social insurance scheme, share of low skilled workers, dummy for coverage by a collective agreement, ordinal variable about the firms' profitability, ordinal variable about the state of machinery and yearly dummies. Standard errors are calculated by bootstrapping with 1000 repetitions. ** and * denote significance at the .01 and .05 levels, respectively. Detailed results available from the author.

Table 7: Effects of Family Firms on Labor Demand (Weighted Difference in Difference Model, Indicator: Owners Working in Establishment, Dependent Variable: abs. Δ Log. of Employment)

	(a) First difference of standard DiD (FD)	(b) Correlated random coeffi-cients model (CRCM)	(c) CRCM	(d) CRCM	(e) FD (empl. ≥ 20)	(f) CRCM (empl. ≥ 20)	(g) CRCM (empl. ≥ 20)	(h) CRCM (empl. ≥ 20)
Family firms in t	-0.017**	-0.019**	-0.016**	-	-0.007*	-0.006*	-0.006	-
	(0.003)	(0.006)	(0.005)		(0.003)	(0.003)	(0.008)	
Family firms in t-1	-	-	0.015**	-	-	-	0.005*	-
			(0.003)				(0.002)	
Firms becoming family firms	-	-	-	0.008	-	-	-	0.003
				(0.007)				(0.005)
Firms becoming non family firms	-	-	-	0.029**	-	-	-	0.008
				(0.005)				(0.004)
Test variable ρ	-	-0.061**	-0.059**	-0.039	-	-0.008	-0.003	0.006
		(0.022)	(0.012)	(0.031)		(0.010)	(0.012)	(0.009)
"Demeaned" co-variates	-	yes	yes	yes	-	yes	yes	yes
R^2	0.0087	0.5564	0.5357	0.5572	0.0049	0.5358	0.5234	0.5389
Wald-Test χ^2	222**	313**	625**	871**	49**	262**	175**	244**
(df.)	(12)	(38)	(39)	(39)	(12)	(38)	(39)	(39)
Obs.	61,203	88,719	64,422	85,747	24,977	37,015	26,098	37,015
(Establ.)		(22,651)	(15,839)	(21,866)		(9,930)	(6,804)	(9,930)

Source: IAB Establishment Panel 2001 - 2015.

Note: The model also includes the following variables: Log. of average wages, log. of value added, log. of investment, share of parttime workers, share of female workers, share of temporary employed, share of employed subject to the social insurance scheme, share of low skilled workers, dummy for coverage by a collective agreement, ordinal variable about the firms' profitability, ordinal variable about the state of machinery and yearly dummies. Standard errors are calculated by bootstrapping with 1000 repetitions. ** and * denote significance at the .01 and .05 levels, respectively. Detailed results available from the author.

Table 8: Effects of Family Firms on Labor Demand (Weighted Difference in Difference Model, Indicator: Owners Working in Establishment, Dependent Variable: abs Δ Log. of Employment wo. Owners)

	(a) First difference of standard DiD (FD)	(b) Correlated random coeffi-cients model (CRCM)	(c) CRCM	(d) CRCM	(e) FD (empl. ≥ 20)	(f) CRCM (empl. ≥ 20)	(g) CRCM (empl. ≥ 20)	(h) CRCM (empl. ≥ 20)
Family firms in t	-0.048**	-0.067**	-0.069**	-	-0.010**	-0.009*	-0.012**	-
	(0.004)	(0.009)	(0.006)		(0.003)	(0.004)	(0.008)	
Family firms in t-1	-	-	0.035**	-	-	-	0.010**	-
			(0.004)				(0.003)	
Firms becoming family firms	-	-	-	0.004	-	-	-	0.007
				(0.008)				(0.006)
Firms becoming non family firms	-	-	-	0.094**	-	-	-	0.016**
				(0.006)				(0.004)
Test variable ρ	-	-0.183**	-0.180**	-0.084**	-	-0.019	-0.019	0.001
		(0.029)	(0.016)	(0.010)		(0.012)	(0.013)	(0.009)
"Demeaned" co-variates	-	yes	yes	yes	-	yes	yes	yes
R^2	0.0131	0.5513	0.5256	0.5542	0.0056	0.5321	0.5145	0.5336
Wald-Test χ^2	269**	479**	785**	1056**	44**	209**	172**	252**
(df.)	(12)	(37)	(38)	(38)	(12)	(37)	(38)	(38)
Obs.	56,814	84,822	61,340	84,822	23,310	35,500	25,038	35,500
(Establ.)		(21,619)	(15,083)	(21,619)		(9,512)	(6,547)	(9,512)

Source: IAB Establishment Panel 2001 - 2014.

Note: The model also includes the following variables: Log. of average wages, log. of value added, log. of investment, share of parttime workers, share of female workers, share of temporary employed, share of employed subject to the social insurance scheme, share of low skilled workers, dummy for coverage by a collective agreement, ordinal variable about the firms' profitability, ordinal variable about the state of machinery and yearly dummies. Standard errors are calculated by bootstrapping with 1000 repetitions. ** and * denote significance at the .01 and .05 levels, respectively. Detailed results available from the author

Table 9: Effects of Family Firms on Labor Demand (Weighted Difference in Difference Model, Indicator: Managed by Executives of the Owner Family, Dependent Variable: abs. Δ Log. of Employment)

	(a) First difference of standard DiD (FD)	(b) Correlated random coeffi-cients model (CRCM)	(c) CRCM	(d) CRCM	(e) FD (empl. ≥ 20)	(f) CRCM (empl. ≥ 20)	(g) CRCM (empl. ≥ 20)	(h) CRCM (empl. ≥ 20)
Family firms in t	-0.012*	-0.020**	-0.026**	-	0.001	0.002	0.002	-
	(0.006)	(0.007)	(0.008)		(0.005)	(0.003)	(0.004)	
Family firms in t-1	-	-	-0.003	-	-	-	-0.007	-
			(0.004)				(0.004)	
Firms becoming family firms	-	-	-	-0.014	-	-	-	-0.010
				(0.012)				(0.010)
Firms becoming non family firms	-	-	-	0.025*	-	-	-	-0.008
				(0.028)				(0.007)
Test variable ρ	-	-0.045*	-0.090**	-0.025	-	-0.010	-0.030	-0.024
		(0.020)	(0.021)	(0.014)		(0.015)	(0.018)	(0.019)
"Demeaned" co-variates	-	yes	yes	yes	-	yes	yes	yes
R^2	0.0336	0.6210	0.6082	0.6336	0.0063	0.5874	0.5554	0.6096
Wald-Test χ^2	499**	774**	696**	820**	34**	238**	191**	222**
(df.)	(12)	(32)	(33)	(33)	(12)	(32)	(33)	(33)
Obs.	33,376	52,449	36,620	46,367	12,953	20,516	14,094	18,078
(Establ.)		(15,359)	(10,823)	(14,238)		(6,195)	(4,320)	(5,694)

Source: IAB Establishment Panel 2007 - 2015.

Note: The model also includes the following variables: Log. of average wages, log. of value added, log. of investment, share of parttime workers, share of female workers, share of temporary employed, share of employed subject to the social insurance scheme, share of low skilled workers, dummy for coverage by a collective agreement, ordinal variable about the firms' profitability, ordinal variable about the state of machinery and yearly dummies. Standard errors are calculated by bootstrapping with 1000 repetitions. ** and * denote significance at the .01 and .05 levels, respectively. Detailed results available from the author.

Table 10: Effects of Family Firms on Labor Demand (Weighted Difference in Difference Model, Indicator: Managed by Executives of the Owner Family, Dependent Variable: abs. Δ Log. of Employment wo. Owners)

	(a) First difference of standard DiD (FD)	(b) Correlated random coeffi-cients model (CRCM)	(c) CRCM	(d) CRCM	(e) FD (empl. ≥ 20)	(f) CRCM (empl. ≥ 20)	(g) CRCM (empl. ≥ 20)	(h) CRCM (empl. ≥ 20)
Family firms in t	-0.010	-0.033**	-0.032**	-	0.001	0.004	0.003	-
	(0.007)	(0.008)	(0.009)		(0.005)	(0.004)	(0.004)	
Family firms in t-1	-	-	0.000	-	-	-	-0.007	-
			(0.005)				(0.004)	
Firms becoming family firms	-	-	-	0.012	-	-	-	-0.008
				(0.013)				(0.010)
Firms becoming non family firms	-	-	-	0.033**	-	-	-	-0.008
				(0.011)				(0.007)
Test variable ρ	-	-0.041*	-0.102**	-0.024	-	-0.001	-0.023	-0.015
		(0.020)	(0.025)	(0.016)		(0.016)	(0.019)	(0.020)
"Demeaned" co-variates	-	yes	yes	yes	-	yes	yes	yes
R^2	0.0139	0.6260	0.5935	0.6530	0.0064	0.5850	0.5514	0.6070
Wald-Test χ^2	179**	1015**	696**	791**	38**	238**	183**	222**
(df.)	(12)	(32)	(33)	(33)	(12)	(32)	(33)	(33)
Obs.	33,043	51,834	36,056	45,821	12,947	20,506	14,084	18,070
(Establ.)		(15,197)	(10,645)	(14,073)		(6,196)	(4,319)	(5,695)

Source: IAB Establishment Panel 2007 - 2015.

Note: The model also includes the following variables: Log. of average wages, log. of value added, log. of investment, share of parttime workers, share of female workers, share of temporary employed, share of employed subject to the social insurance scheme, share of low skilled workers, dummy for coverage by a collective agreement, ordinal variable about the firms' profitability, ordinal variable about the state of machinery and yearly dummies. Standard errors are calculated by bootstrapping with 1000 repetitions. ** and * denote significance at the .01 and .05 levels, respectively. Detailed results available from the author.

Appendix

Table A.1: Descriptive Statistics of the Used Data

Variable	Obs.	Mean	Std. Dev.	Min.	Max.
Dummy for eastern Germany	262950	0,596	0,491	0	1
Year of founding	208757	1993,639	6,459	1989	2015
Log. Wage per capita	216104	7,382	0,678	1,730	10,690
No. of employed	259996	138,212	724,919	0,5	57546
No. of owners working in the establishment	216673	1,040	1,621	0	378
Share of part-time workers	259996	0,223	0,261	0	1
Share of time limited workers	261391	0,056	0,148	0	1
Share of workers subject to the social security scheme	262949	0,763	0,278	0	1
Share of female workers	262590	0,430	0,313	0	1
Share of low qualified	260801	0,173	0,244	0	0,999
Dummy for est. w. collective bargaining	260696	0,705	0,456	0	1
Dummy for est. w. workers councils	260104	0,312	0,463	0	1
Log. of turnover	178540	14,191	2,242	6,095	24,484
Log. of value added	154590	13,358	2,203	3,792	22,709
Log. of investment	252587	5,858	7,826	-4	23,125
State of machinery (ordinal scale, 1 = very good)	260511	2,220	0,781	1	5
Profitability (ordinal scale, 1 = very good)	219648	2,959	1,063	1	5

Source: IAB Establishment Panel 2001 - 2015

Table A.2: Relative Bias of Matched and Unmatched samples (in %)

	Owners working in establishment	Owners working in establishment (empl. ³ 20)	Owners working in establishment (empl. wo. owners)	Owners working in establishment (empl. wo. Owners and ³ 20)	Managed by owners	Managed by owners (empl. ³ 20)	Managed by owners (empl. wo. owners)	Managed by owners (empl. wo. Owners and ³ 20)
Log. of turnover	1.00	0.40	1.30	0.30	-1.50	1.20	-1.60	1.40
Log. of investment	-0.20	-0.80	0.50	-0.90	2.40	2.30	3.70	2.50
Establishment size (av.)	0.29	0.00	0.34	0.00	-0.69	0.02	-0.53	0.04
Year of founding (av.)	0.10	-0.15	0.04	-0.12	-1.18	0.05	-1.09	0.03
Profitability (av.)	0.03	0.28	-0.04	0.34	-1.00	-0.33	-0.85	-0.30
State of machinery (av.)	0.11	-0.08	0.14	-0.05	-0.03	0.53	-0.53	0.48
Year of Obs. (av.)	-0.03	0.01	0.01	-0.01	0.00	-0.02	0.00	0.00
Industries (av.)	-0.10	-0.19	-0.11	-0.18	0.21	0.05	0.25	0.05
Eastern Germany	-4.60	-0.50	-3.80	-0.60	-0.10	1.80	2.60	1.70

Source: IAB establishment panel 2001 - 2015.

Table A.3: Propensity Score Estimates of being a family firm

	Owners working in establishment	Owners working in establishment (empl. ≥20)	Owners working in establishment (empl. wo. owners)	Owners working in establishment (empl. wo. Owners and ≥20)	Managed by owners	Managed by owners (empl. ≥20)	Managed by owners (empl. wo. owners)	Managed by owners (empl. wo. Owners and ≥20)
Log. of turnover	-0.238** (0.006)	-0.216** (0.009)	-0.233** (0.005)	-0.216** (0.009)	-0.433** (0.009)	-0.453** (0.012)	-0.438** (0.009)	-0.453** (0.012)
Log. of investments	0.0165** (0.001)	0.015** (0.001)	0.016** (0.001)	0.015** (0.001)	0.010** (0.001)	0.007** (0.001)	0.010** (0.001)	0.007** (0.001)
LR-Test χ^2 (df.)	8406.56** (108)	2492.90** (104)	7295.82** (107)	2382.04** (103)	21311.43** (94)	6180.65** (89)	20117.18** (94)	6181.99** (89)
Log likelihood	-44,318.374	-22,791.303	-41,909.49	-21,804.576	-22,353.39	-13,677.45	-22023.52	-13675.14
Pseudo R^2	0.0866	0.0519	0.0801	0.0518	0.3228	0.1843	0.3135	0.1844
Obs. (no. of family firms)	107,363 (89,377)	42,926 (32,286)	98,626 (81,481)	41,146 (41,146)	65,051 (51,707)	24,631 (14,250)	61,550 (48,282)	24,628 (14,247)

Source: IAB Establishment Panel 2001 - 2015.

Note: The model also includes the following dichotomous and auxiliary variables: year of founding (23 dummies), establishment size (seven), firm profitability (five), state of machinery (five), industry (fourty), year (fourteen), a dummy for eastern Germany and a constant. Semi-robust standard errors adjusted for clustering on establishments and years in parentheses. ** and * denote significance at the .01 and .05 levels, respectively.

Table A.4: Quality of Propensity Score Estimates (Radius Matching, Caliper 0.001)

	Pseudo R^2	Mean of standardized Bias	Median of standardized Bias
Owners working in estalishment	0.003	0.9	0.7
Owners working in estalishment (empl. ≥ 20)	0.001	0.7	0.5
Owners working in estalishment (empl. wo. owners)	0.003	0.9	0.7
Owners working in estalishment (empl. wo. Owners and ≥ 20)	0.001	0.7	0.6
Managed by owners	0.030	3.0	2.1
Managed by owners (empl. ≥ 20)	0.003	1.0	0.6
Managed by owners (empl. wo. owners)	0.027	2.8	1.9
Managed by owners (empl. wo. Owners and ≥ 20)	0.003	1.0	0.6

Pseudo R2 from probit estimations of the propensity score on all the variables on matched samples. Dependent variable indicates whether the unit is treated or not. The standardized bias is the difference of the sample means in the treated and non-treated sub-samples as a percentage of the square root of the average of the sample variances in the treated and non-treated groups following the method by Rosenbaum and Rubin (1985). The results are derived from STATA module "psmatch2" (cf. Leuven / Sianesi 2003).

Table A.5: Results of a simple Difference-in-Difference Model (Indicator: Owners Working in Establishment)

	Log. of employment		Changes in log. of employment	
	Unmatched sample	Matched sample	Unmatched sample	Matched sample
Owners working in estalishment	-0.881**	0.079**	0.014**	0.020**
	(0.014)	(0.020)	(0.002)	(0.002)
Owners working in estalishment (empl. ≥ 20)	-0.298**	0.005	0.008**	0.005**
	(0.012)	(0.015)	(0.002)	(0.002)
Owners working in estalishment (empl. wo. owners)	-0.987**	-0.141**	-0.029**	-0.064**
	(0.015)	(0.020)	(0.002)	(0.003)
Owners working in estalishment (empl. wo. Owners and ≥ 20)	-0.324**	-0.026	0.002	-0.005**
	(0.013)	(0.015)	(0.002)	(0.002)

Source: IAB establishment panel 2001 - 2015.

Table A.5:Results of a simple Difference-in-Difference Model (Indicator: Managed by Executives of the Owner Family)

	Log. of employment		Changes in log. of employment	
	Unmatched sample	Matched sample	Unmatched sample	Matched sample
Managed by owners	-2.023**	-0.015	0.001	0.006
	(0.015)	(0.039)	(0.002)	(0.005)
Managed by owners (empl. ≥ 20)	-0.698**	0.017	0.005**	0.003
	(0.013)	(0.020)	(0.002)	(0.003)
Managed by owners (empl. wo. owners)	-2.132**	-0.117**	0.005	0.014**
	(0.016)	(0.038)	(0.003)	(0.005)
Managed by owners (empl. wo. Owners and ≥ 20)	-0.719**	0.005	0.006**	0.004
	(0.013)	(0.020)	(0.002)	(0.003)

Source: IAB establishment panel 2001 - 2015.

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