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Family Firms and Labor Demand: Size Matters – But Only the Small Ones are Different

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Abstract

This paper analyzes the differences in labor demand between family and non-family firms. The majority of firms in modern economies are still family controlled. In addition, these firms seem to exhibit better employment performance than other companies. Therefore, this study estimates a labor demand model with German establishment panel data. Moreover, a Heckman correction is introduced to the regressions to avoid selectivity. The results of random effects and fractional panel probit estimations indicate that own-wage and output elasticities are lower in absolute values, thus supporting the assumption that family firms offer higher job security and are more risk averse than other establishments. However, this result does not hold if the investigation is restricted to establishments with 20 or more employees. There is no evidence of different behavior in larger family firms.

Zusammenfassung

Der größte Teil der deutschen Unternehmen wird von Eigentümern und deren Familien gesteuert. Zusätzlich gibt es Hinweise darauf, dass diese Familienunternehmen eine bessere wirtschaftliche Entwicklung und einen höheren Beschäftigungsstand aufweisen als Firmen mit einer anderen Eigentümerstruktur. Die vorliegende Studie untersucht daher mit Hilfe von Betriebspaneldaten die Unterschiede in der betrieblichen Arbeitsnachfrage zwischen Familienfirmen und anderen Betrieben. Die multivariaten Schätzungen der Arbeitsnachfrage berücksichtigen dabei die Selektivität der Daten, die durch die Entscheidung für die Eigentümerstruktur hervorgerufen wird. Verschiedene Panelschätzer (Random Effects, Fractional Panel Probit) bestätigen zunächst die Hypothese, dass Familienfirmen eine höhere Jobsicherheit bieten, dafür aber eine geringere Entlohnung aufweisen. Wird die Analyse auf größere Betriebe beschränkt, zeigt sich ein anderes Ergebnis. Es scheint so, dass sich Betriebe mit mindestens 20 Beschäftigten nicht anders verhalten als vergleichbare Firmen, die nicht von Eigentümern geleitet werden.

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Introduction

Like in most industrial countries, family businesses in Germany constitute the largest part of firms in private ownership (Klein 2000). Families own or control about 90% of the privately owned companies in Germany, are responsible for more than 40% of all sales and employ more than 50% of total workforce in these firms. 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]). The economic relevance of this kind of ownership structure led to significant interest in the behavior and performance of family firms compared to other privately held firms.

As family firms increased their employment in previous years whereas other important firms in Germany did not, there are probably differences in labor demand and the reaction of family firms to economic shocks from changes in wages or demand for goods. Therefore, the subsequent analysis applies a labor demand model and German establishment panel data to estimate differences between family and non-family firms. In particular, a translog cost function is used to derive a structural labor demand model that is estimated with a random effects regression and a fractional panel probit approach. In addition, we detect some selectivity in the data when we observe family firms. Therefore, a Heckman correction is added to the regressions.

Initial estimation results support the hypothesis that family firms offer implicit employment contracts in which job security is related to lower wages and that they are more risk averse compared to other firms. However, these results only hold for small firms. If the analysis is restricted to establishments with 20 and more employees, most of the differences in labor demand disappear. Therefore, it seems that only small family firms show special behavior in labor demand.

The paper is organized as follows. The next section presents the results of previous research. Section 3 constitutes the labor demand model and Section 4 introduces the establishment data from Germany. The results of the empirical analysis are discussed in Section 5. Finally, the outcome is summarized in Section 6.

1 Previous Research

Several previous studies investigate the influence of the ownership structure on firm performance and employment. Much of the existing research relies on the assumption that owners and executives from an owner family are identified with the actions of a family firm. In addition, family businesses probably have longer time horizons related to other entities and are more cautious in changing their employment (cf. Anderson & Reeb 2003, Bandiera et al. 2015, Bassanini et al. 2013, Block 2010, D'Aurizio & Romano 2013, Sraer & Thesmar 2007). In addition, some studies argue that family firms also follow altruistic incentives (Miller & Le Breton-Miller 2006).

Two aspects that influence labor demand in family firms are the job security of the employees and the risk aversion of executives from the owner family. The former is often related to implicit employment contracts, in which implicit job security is offered in return for lower wages, and the latter implies a faster adjustment of employment back to equilibrium after an economic shock. Both lead to smaller own-wage and output elasticities in absolute values.

The results of Sraer and Thesmar (2007) and Bassanini et al. (2013) support the idea that family firms offer implicit contracts to their employees in return for lower wages among French firms. In addition, Bjuggren (2015) comes to the same conclusion with Swedish microdata. Moreover, Bjuggren (2015) identifies that turnover and employment are less volatile within family firms. Lee (2006) and Block (2010) find that family firms are less likely to reduce employment during an economic shock.

If risk aversion forces family firm decisions, it leads 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). Contrary to this argument, a family firm could be more willing to accept below-target perfor-

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

mance to avoid the loss of so-called socioemotional wealth that includes the ability of the owner family to lead the firm as well as 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).

Miller et al. (2013) state that the performance of family firms also depends on firm size. While larger firms usually perform better than smaller ones, the advantages of scale in larger companies are smaller if a family member acts as CEO. In addition, on average, founders increase the performance of their firms, and if a founder leaves management, in general a professional manager outperforms an heir (Burkart et al. 2003; Anderson & Reeb 2003; Villalonga & Amit 2006; Adams et al. 2009).

The study at hand aims to identify differences in labor demand between family firms compared to other businesses at the establishment level. The demand for labor is normally analyzed within a functional framework, like a translog, CES or generalized Leontief cost or production function, to derive labor demand elasticities as a measure of the flexibility and efficiency of the labor market (Hamermesh 1993). None of the studies that analyse labor demand focus directly on the ownership structure. Among others, Kölling (2012, 2014), Addison and Teixeira (2001) and Flaig and Rottmann (2001) estimated the wage elasticities for Germany with microdata. Values were found to be between -0.4 and -0.6, whereas the calculated output elasticities were between 0.6 and 0.8. This implies that, if the wage increases by 10%, employment will decrease by 4 to 6%. However, if the demand for produced goods or services rises also by 10%, employment increases by 6 to 8%. Lichter et al. (2014) find in a meta-analysis of 942 elasticity estimates from 105 different international studies of labor demand an overall mean own-wage elasticity of labor demand of -0.508 (median: -0.386), with a standard deviation of 0.774. More than 80% of all estimates lie within the expected interval of zero to minus one. However, from their analysis they conclude that own-wage elasticities in most of the studies are upwardly inflated by several sources, e.g. a publication bias. Journals prefer to accept statistically significant results and economists do not question some economic relationships. Therefore, referees and editors seem to publish expected empirical results rather than unusual outcomes (Card and Krueger, 1995). After this quick review of the existing literature, the next section introduces the model that is used in the subsequent investigation.

2 Model

The focus of this stage of the analysis is on the effects of family firms compared to establishments with a different ownership structure on a firms overall labor demand. Therefore, a labor demand model with two factors of production, capital and labor, is applied. In the following, it is assumed that production is heterothetic; this is a more general case than a linear homogenous production function. In a heterothetic production function, output is related to factor prices and depends on the scale of the output. In particular, the model used here is based on a translog cost function (Hamermesh 1993). Next to the generalized Leontief or CES-functions, this functional form is very common in the literature (Falk & Koebel 2004, Freier & Steiner 2010). Usually, the translog cost function in its heterothetic form is derived from the following general form (Berndt & Khaled 1979):

(1) C = C(w, r, Y)
where C is the cost, r is the interest rate and Y is the production level of the firm.

As such, the translog cost function derived from (1) is applied in the following analysis:

(2) $lnC = lnY + a_0 + a_1 \cdot lnw + (1-a_1) \cdot lnr + 0.5 \cdot b_1 \cdot lnw^2 + b_2 \cdot lnw \cdot lnr + 0.5 \cdot b_3 \cdot lnr^2 + d \cdot lnY \cdot lnw^* + (1- d) \cdot lnY \cdot lnr$
where: a_i, b_i and d are the parameters and LnC, lnY, lnw and lnr are the logarithms of C, Y, w and r, respectively. Applying Shephard's lemma to labor input and taking the ratio to labor costs into account yields:

(3) $s = a_1 + b_1 \cdot lnw + b_2 \cdot lnr + d \cdot lnY,$

where $s = \frac{w \cdot L}{Y}$ (share of labor costs in total revenue).

This model is very useful for an empirical analysis, but oversimplifies some aspects of labor demand. More specifically, the wage bill $w \cdot L$ does not only depend on the number of employees, it also depends on the formation of a firm's labor force. Therefore, worker characteristics have to be included in the analysis. In addition, it is well-known that the remuneration of the employees differs between the firm size, industry and union coverage (Groshen 1991). For these reasons, some additional variables Z_j are included. The influence of family firms on labor demand is introduced into the model through a dummy variable f that indicates the existence of a family firm and interaction variables of these dummies with wages w, interest rates r, production level Y and the additional variables Z_j. This leads to the following expression:

$$(4) \quad s = a_1 + f + b_1 \cdot lnw + b_{1f} \cdot f \cdot lnw + b_2 \cdot lnr + b_{2f} \cdot f \cdot lnr + d \cdot lnY + d_f \cdot f \cdot lnY + e_j \cdot Z_j + e_{jf} \cdot f \cdot Z_j,$$

with b_{1f}; b_{2f}; d_f and e_{jf} as parameters of the interaction variables. To estimate the effects of changes in wages, interest rates and output on labor demands, the corresponding elasticities are derived from the estimates of Equation (4). The elasticities of labor demand indicate relative changes in the amount of labor when wages, interest or demands are altered with a specific rate (Hamermesh 1993). Taking into account that s is defined as the share of labor costs in total revenue, the elasticities are easily calculated from the marginal effects of the relevant variables (b_1; b_2 and d for non-family firms resp. $b_1 + b_{1f}$; $b_2 + b_{2f}$ and $d + d_f$ for family firms) on s, i.e. $\partial s / \partial \ln w$; $\partial s / \partial \ln Y$ and $\partial s / \partial \ln r$ for family or non-family firms:

$$(5) \quad \eta_{Lw} = \frac{\partial L / L}{\partial w / w} = \frac{b_1 + b_{1f}}{s} - 1 \text{ for family firms resp. } \eta_{Lw} = \frac{\partial L / L}{\partial w / w} = \frac{b_1}{s} - 1 \text{ for other firms.}$$

$$(6) \quad \eta_{Lw} = \frac{\partial L / L}{\partial r / r} = \frac{b_2 + b_{2f}}{s} \text{ for family firms resp. } \eta_{Lr} = \frac{\partial L / L}{\partial r / r} = \frac{b_2}{s} \text{ for other firms.}$$

$$(7) \quad \eta_{LY} = \frac{\partial L / L}{\partial Y / Y} = \frac{d + d_f}{s} + 1 \text{ for family firms resp. } \eta_{LY} = \frac{\partial L / L}{\partial Y / Y} = \frac{d}{s} + 1 \text{ for other firms.}$$

The η are the elasticities of labor with respect to changes in the respective variables. From the theory, we expect that η_{Lw} will be negative and η_{LY} will be positive, because the demand for labor decreases with an increase in the price for labor, but increases when production increases. This implies that b_1 resp. $b_1 + b_{1f}$ should be smaller than s and d resp. $d + d_f$ should be larger than -s. In addition, when capital is more or less a quasi-fixed asset in the short run, the value of η_{Lr}, and therefore, b_2 resp. $b_2 + b_{2f}$ should both be close to zero.

The labor demand model used here is a static model and does not contain lagged variables, like a dynamic model does, to calculate the adjustment processes. As most of the adjustment process takes place within a year and annually data is overaggregated, this assumption is reasonable (Hamermesh 1993, 253 pp.). Additionally, the use of lagged dependent variables to model labor demand dynamics is caused by a quadratic adjustment of the cost function. This is very restrictive, and also questionable, as empirical studies with other cost functions, like lumpy or linear costs, illustrate results with at least the same efficiency (Hamermesh 1993). Before this model is tested empirically, the data to be used is described.

3 Data

The analysis uses data from the IAB Establishment Panel. The establishment data was obtained from the Institute for Employment Research of the Federal Labor Agency. They began collecting this data in Western Germany in 1993 and in the former eastern part of Germany in 1996. The dataset was created to meet the needs of the Federal Employment Agency for improved information on the demand side of the labor market. It is based on a stratified random sample. The strata currently include 17 industries, 10 employment size classes, and 16 regions (the Bundesländer), from all German establishments with at least one employee covered by social insurance (Fischer, Janik et al. 2008, 2009). In the work at hand, the data is restricted to the Period from 2001 to 2013, because some of the variables used in the regressions have been collected since then.

The establishment panel is characterized by a very high response rate of over 70% (80% for repeatedly participating establishments). To correct for panel mortality, exits, and newly founded units, the data were augmented and regularly yield an unbalanced panel. Overall, the IAB panel contains data for approximately 16,000 establishments each year (Fischer, Janik et al. 2008, 2009).

The dependent variable is defined as the share of labor costs of total revenue. The IAB Establishment Panel contains information about the firm's turnover in the year prior to the interview. It also contains information about the wage bill in June of each year, the target month of the survey and the number of employees in the same month. The turnover was therefore divided by 365 to obtain the average monthly turnover of an establishment and in the following a correct measure of the share of labor costs of total revenue. Because the turnover was used, establishments that do not report turnover, including banks, insurance companies and public administrations, were excluded from the database. The primary explanatory variables in the theoretical model include the logs of value added (intermediate materials excluded from turnover), wages and costs of capital. In addition, the nominal values of value added and wages were discounted by the producer price index. The annual mean of the 12 month Euribor was used as an instrument for the cost of capital. The Euribor is the rate at which the Euro interbank term deposits within the Euro Zone are offered by one prime bank to another prime bank. This rate is often used as a reference for the refinancing of commercial banks. Therefore, it is often the basis for the base rates of company loans.

The ownership structure is indicated through three different variables in the data. The first one is a dummy variable whether the owners work in the establishment or not. In addition, the IAB establishment panel surveys the composition of the establishment's management, which is used to calculate two additional variables concerning the topic of the paper. Firstly, family firms are defined as establishments, where owners exclusively run the firm as the business executives. Secondly, in a broader definition of family firms, these kinds of establishments are identified as firms, where only some business executives are family members. While the number of owners working in the establishment is observed in every wave of the panel, the composition of management has been surveyed since 2007. Therefore, the analysis of the two variables that deal with this information is restricted to seven years from 2007 to 2013, the newest data available at the time of investigation. In the following, some descriptive statistics for the variables that identify family firms in the data are presented. Table 1 shows the number and share of family firms in the survey. During the observed period, 72.53% of all establishments surveyed in the panel, representing 195,355 observations, reported that some or all owners are working in the entity. Since 2007, the establishment panel has collected data if owners act as business executives. More than three quarters of the establishments state that they are managed partly or exclusively by owners. Because the period for these variables is shorter, we also observe a smaller number of firms. From this result, one might consider that both variables exhibit almost the same measure. Therefore, we calculate a correlation coefficient that indicates whether the variables are related to each other. As the observations are dummies, Table 2 contains a spearman's correlation coefficient. The results show that the variables are positively correlated with each other. Both correlation coefficients are highly significant, but their values are not larger than 0.37. Therefore, 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 completely constant over the observed time. A total number of 6,869 establishments report between 2001 and 2013 that they become a family firm, whereas 7,474 state that the members of the owner families have left the entities. This means that about 10% of the observed establishments change their status in the surveyed

period. The figures for the members of family firms acting as business executives are lower. However, this is not only due to the shorter time period. Less than 4% of the establishments report 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 work as apprentices, trainees or as other workers, if they are not the actual owners of the company.

	Obs.	Share of all Obs.
Owners working in establishment (2001 – 2013)	195,355	72.53%
Exclusively managed by owners (2007 – 2013)	60,236	68.55%
Exclusively or partly managed by owners (2007 – 2013)	66,453	75.63%

Table 1: ***Number and Share of Establishments Managed by Owners*** **(IAB Establishment Panel 2001 - 2013)**

	Owners working in establishment
Exclusively managed by owners (2007 – 2013)	0.3686** (87,865)
Exclusively or partly managed by owners (2007 – 2013)	0.3541** (87,865)

Table 2: ***Spearman's Correlation Coefficients of Family Firm Dummies*** **(IAB Establishment Panel 2007 - 2013.)**

Note: No. of Obs. in parentheses. ** and * denote significance at the .01 and .05 levels, respectively

	Owners working in establishment	Exclusively managed by owners (2007-2013)	Exclusively or partly managed by owners (2007-2013)
Never family firm	31,492	17,458	13,488
Always family firm	98,502	40,489	44,794
Switch to family firm	6,869	1,177	1,010
Switch to non-family firm	7,474	1,057	889
Total no. of obs.	144,337	60,181	60,181

Table 3: ***Changes in the status of Family Firms between t and t+1*** **(IAB Establishment Panel 2001 – 2013)**

According to the theoretical considerations, additional variables were used in the estimations. These variables include the percentage of female employees, part-timers, and temporary workers and workers that are respectively low skilled or subject to the German social security scheme. Additional dummy variables were used to represent establishment size, firm profitability, whether the establishment is covered by a collective agreement, particular industries and years, and finally location in western Germany. Descriptive statistics for the principal variables used in this paper are available from the author.

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 micro data generally should not have problems with the endogeneity of the mentioned variables (Freier & Steiner 2010; Hamermesh 1993, 68pp.). 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 indicate substantial excess in the labor supply. Hence, the assumption of exogeneity does not seem to be too unrealistic. But one has to keep in mind that, at least for the highly skilled workers, the situation on the German labor market has changed over the last 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. Therefore, one must take care when approaching the selectivity of the data. To overcome the selectivity problem, a two-stage Heckman correction is applied to the regressions in which, during the first stage, the inverse Mills ratio IMR is calculated from a pooled probit estimation of the probability of being a family firm (Heckman 1979). In the second stage, the calculated IMRs are introduced to the estimations of establishments' labor demand. One important variable that determines the firms' ownership structure is the year of the firm's founding. Because this information is collected systematically in the IAB Establishment Panel since 2001, the data set used in the work at hand is restricted to twelve waves from 2001 to 2013. In the following section, the estimation method and the particular specification of the regressions are introduced.

4 Estimates

In this paper, we choose two different estimation procedures to estimate the parameters of the model. The first strategy is the conventional textbook method of random effects regressions with a log-odds transformation of the dependent variable for a share equation; the second is the use of a maximum likelihood estimation of a fractional panel probit model to determine labor demand at the level of establishments.

The share s in the model has values between 0 and 1. As such, a log-odds transformation converts the response variable to one that covers the interval from $-\infty$ to ∞. This allows for a linear estimation of the model. It also makes it possible to take into account the unobserved establishment effects c_i. Unfortunately, Wooldridge (1995) shows that the introduction of the inverse Mills ratio IMR to control for selectivity leads to inconsistent estimators. Therefore, a random effects model is applied here (Chamberlain 1980). Although, two severe problems can occur when this procedure is used. Firstly, shares of zero and one are not defined when a log-odds transformation is conducted. Secondly, a linear functional form does not reflect the important non-linearities that are possible. To overcome these problems, Papke and Wooldridge (2008) proposed a fractional panel probit model that allows for the estimation of average partial effects for fractional response data. In this model, it is possible to use responses at the corners of zero and one for the calculations. In addition, the non-linear models and the estimates of the variables that do not change over time or establishments are feasible. Additional information about the estimation methods are available from the author.

In the following, we will assume that the decision of being a family firm depends on several arguments that also influence the outcome variable. This would lead to the selectivity of the data and inconsistent results of the regression analysis. To overcome this problem, one can apply a Heckman correction, i.e. a two-step method to receive unbiased parameter values (Heckman 1979). In the first stage, a pooled probit regression is conducted, estimating the probability that the observed entity is a family firm. Therefore, the dependent dummy variable indicates whether the owner family run the establishment or not. The application of the Heckman correction needs a set of regressors that is different compared to those used in the labor demand equations and, in addition, give a good explanation of the dependent variable. Table 4 shows the results of the estimations for the three indicators of family firms.

	(a) Owners working in establishment	(b) Exclusively managed by owners	(c) Exclusively or partly managed by owners
Log. of wages per capita	-0.157** (0.013)	-0.350** (0.020)	-0.390** (0.022)
Log. of turnover	-0.090** (0.007)	-0.244** (0.010)	-0.205** (0.011)
Log. of investment	0.015** (0.001)	0.008** (0.001)	0.009** (0.001)
Share of part-time workers	-0.759** (0.029)	-0.671** (0.045)	-0.691** (0.048)
Share of temp. Employed	-0.323** (0.042)	-0.541** (0.059)	-0.529** (0.060)
Share of employed persons subjected to the social insurance scheme	-2.550** (0.040)	-2.029** (0.059)	-2.134** (0.065)
Share of female workers	-0.065** (0.024)	0.009 (0.036)	0.044 (0.038)
Share of low skilled workers	-0.518** (0.022)	-0.012 (0.034)	-0.039 (0.035)
Coverage by a collective agreement	-0.049** (0.013)	-0.017 (0.018)	-0.061** (0.020)
Dummy for the existence of a workers council	-0.534** (0.016)	-0.835** (0.022)	-0.898** (0.022)
Pseudo-R^2	0.1645	0.4330	0.3975
Log. Likelihood	-41,188	-19,315	-17,788
LR-Test χ^2 (df.)	16,221** (99)	29,500** (90)	23,474** (90)
Obs.	105,377	56,662	56,662

Table 4: *Pooled Probit Estimations of Being a Family Firm* (IAB Establishment Panel 2001 – 2013)

*Note: The model also includes the following dichotomous and auxiliary variables: establishment size (seven dummies), firm profitability (eight), state of machinery (four), industry (fourty), year of founding (twenty-four) and a constant. Robust standard errors adjusted for clustering on establishments in parentheses. ** and * denote significance at the .01 and .05 levels, respectively.*

An LR-test of joint significance of the used variables rejects the hypothesis that the variables do not contribute to explain the dependent variable. In addition, the size of the Pseudo-R^2 is quite large, especially for columns (b) and (c). In addition, several variables like the log. of turnover, log. of investment, existence of a workers council and state of machinery respective to the year of founding are not used in the subsequent labor demand regressions. The calculated parameter values are commonly significant, except for the share of female workers and the share of low-skilled workers for columns (b) and (c) and the coverage by a collective agreement for firms that are exclusively managed by business executives of the owner family. In particular, the results confirm that the probability of being a family firm is larger when the average wages and turnover are lower. Moreover, it is less probable to observe a family firm when the shares of female, temporary, part-time and low-skilled workers and those subject to the social insurance scheme are large. Moreover, the existence of a workers council and coverage by a collective agreement seem to reduce the likelihood of being a family-owned establishment. In contrast, there is a positive but highly significant relation between the size of investment and the probability of a family firm. The outcome of the probit estimations are then used to calculate the inverse Mills ratio IMR for each column. The following estimations of labor demand on the establishment level use the IMR to control for selectivity in the data. Tables 5 and 6 show the results of the calculation of the random effects and the fractional panel probit regressions.

	(a) Owners working in establishment	(b) Exclusively managed by owners	(c) Exclusively or partly managed by owners
Dummy for family firms	0.046 (0.117)	-0.062 (0.197)	-0.230 (0.223)
Log. of wages per capita	1.102** (0.018)	1.140** (0.022)	1.101** (0.025)
Dummy for family firms • log. of wages per capita	0.041* (0.018)	0.070** (0.023)	0.093** (0.026)
Log. average 12-month Euribor	-0.069** (0.009)	-0.006 (0.008)	-0.011 (0.009)
Dummy for family firms • log. average 12-month Euribor	0.006 (0.009)	0.004 (0.007)	0.011 (0.008)
Log. of value added	-0.465** (0.007)	-0.492** (0.011)	-0.506** (0.011)
Dummy for family firms • log. of value added	-0.024** (0.005)	-0.011 (0.010)	-0.015 (0.010)
Share of part-time workers	-0.237** (0.043)	-0.185** (0.050)	-0.226** (0.057)
Dummy for family firms • share of part-time workers	-0.009 (0.043)	-0.245** (0.052)	-0.232** (0.059)
Share of temp. Employed	0.448** (0.054)	0.522** (0.065)	0.526** (0.076)
Dummy for family firms • share of temp. Employed	-0.096 (0.059)	-0.227** (0.074)	-0.268** (0.083)
Share of employed persons subjected to the social insurance scheme	0.422** (0.065)	0.241** (0.085)	0.111 (0.103)
Dummy for family firms • Share of employed persons subjected to the social insurance scheme	0.038 (0.065)	-0.121 (0.087)	-0.083 (0.104)
Share of female workers	0.060 (0.031)	0.065 (0.043)	0.038 (0.050)
Dummy for family firms • share of female workers	0.016 (0.030)	-0.033 (0.043)	0.000 (0.050)
Share of low skilled workers	0.360** (0.028)	0.201** (0.033)	0.204** (0.038)
Dummy for family firms • share of low skilled workers	-0.026 (0.029)	-0.013 (0.036)	-0.005 (0.041)
Overall R^2	0.5110	0.5553	0.5455
Wald-Test χ^2 (df.)	54,340** (91)	26,657** (81)	26,099** (81)
Breusch/Pagan-Test $\chi^2(1)$	76,668**	30,863**	30,925**
Obs. (Establ.)	95,270 (27,223)	50,902 (17,386)	50,902 (17,386)

Table 5: ***Random Effects Panel Estimation of Differences in Labour Demand of Family and Non-Family Firms with Selectivity*** **(IAB Establishment Panel 1996 – 2013)**

*Note: The model also includes the following variables: constant, inverse Mills ratio, dummy for Western Germany, dummy for coverage by a collective agreement, establishment size (seven dummies), firm profitability (eight), industry (fourty), year (seventeen). Robust standard errors adjusted for clustering on establishments in parentheses. ** and * denote significance at the .01 and .05 levels, respectively.*

	(a) Owners working in establishment	(b) Exclusively managed by owners	(c) Exclusively or partly managed by owners
Dummy for family firms	-0.092 (0.106)	-0.390* (0.154)	-0.546** (0.176)
Log. of wages per capita	0.682** (0.028)	0.717** (0.034)	0.671** (0.035)
Dummy for family firms • log. of wages per capita	0.045** (0.017)	0.087** (0.019)	0.131** (0.023)
Log. Average 12-month Euribor	-0.056** (0.008)	-0.012 (0.007)	-0.020* (0.008)
Dummy for family firms • log. average 12-month Euribor	0.017* (0.008)	0.010 (0.007)	0.019* (0.008)
Log. of value added	-0.208** (0.009)	-0.269** (0.014)	-0.263** (0.014)
Dummy for family firms • log. of value added	-0.014** (0.004)	0.002 (0.008)	-0.015 (0.008)
Share of part-time workers	-0.217** (0.034)	-0.083* (0.042)	-0.129** (0.048)
Dummy for family firms • share of part-time workers	0.001 (0.034)	-0.237** (0.043)	-0.211** (0.048)
Share of temp. Employed	0.156** (0.040)	0.147** (0.050)	0.132* (0.055)
Dummy for family firms • share of temp. Employed	-0.011 (0.042)	-0.018 (0.051)	-0.032 (0.056)
Share of employed persons subjected to the social insurance scheme	0.212** (0.057)	0.200** (0.066)	0.103 (0.078)
Dummy for family firms • Share of employed persons subjected to the social insurance scheme	-0.007 (0.055)	-0.177** (0.064)	-0.137 (0.076)
Share of female workers	0.061* (0.026)	0.059 (0.037)	0.073 (0.041)
Dummy for family firms • share of female workers	-0.048* (0.023)	-0.047 (0.031)	-0.065 (0.036)
Share of low skilled workers	0.145** (0.025)	0.008 (0.030)	0.001 (0.033)
Dummy for family firms • share of low skilled workers	-0.013 (0.026)	0.088** (0.030)	0.094** (0.033)
Log. Pseudolikelihood	-50,683	-26,746	-26,769
Wald-Test χ^2 (df.)	12,902** (272)	8,580** (262)	8341** (262)
Obs. (Establ.)	95,270 (27,223)	50,902 (17,386)	50,902 (17,386)

Table 6: ***Fractional Panel Probit Estimation of Differences in Labour Demand of Family and Non-Family Firms with Selectivity*** **(IAB Establishment Panel 2001 – 2013)**

*Note: The model also includes the following variables: constant, inverse Mills ratio, dummy for Western Germany, dummy for coverage by a collective agreement, establishment size (seven dummies), firm profitability (eight), industry (fourty), year (seventeen), the mean of time variant explanatory variables, dummies for the number of observations for an establishment and interaction variables between the means and the dummies. Semi-robust standard errors adjusted for clustering on establishments and years in parentheses. ** and * denote significance at the .01 and .05 levels, respectively. The STATA option „cluster" is used to calculate the clustered sandwich estimator to obtain a robust variance estimate that adjusts for within-cluster correlation. The STATA code to estimate the fractional panel probit model is provided in Wooldridge (2011).*

The outcome for the IMR is significant for all estimations in both tables. This indicates that we cannot reject the hypothesis of selectivity when family firms are observed.[2] The results of the Breusch-Pagan-test for the random effects estimation in Table 5 rejects the hypothesis that unobserved firm heterogeneity is irrelevant. Because the fixed-effects estimator is inconsistent when a Heckman correction is introduced (Wooldridge 1995), we do not present the results of a Hausman specification test. The estimated parameters for the random effects model show the expected signs and are of a reasonable size. In all estimations, we find positive and significant results for the interaction variable between wages and family firms, indicating that the overall wage elasticities are less negative for family firms. This finding would support the results of previous studies that family firms offer implicit employment protection. Moreover, it seems that capital and labor are substitutes. The parameter for column (a) is significant and negative. In addition, there are no significant differences among family and non-family firms for this variable. The interaction variable between the log. of value added and a dummy that indicates owners working in the establishment is also significant and negative. This could indicate that the output elasticities in family firms are smaller, and therefore, business cycles less significantly affect labor demand of family firms. Additional differences between family firms and other establishments are found for the share of part-time workers and the share of temporary employees. It seems as if family firms do not prefer temporary or part-time employees. On the other hand, the results for the share of employees subjected to the social security scheme are always insignificant. Thus, it is not possible to argue that family firms prefer some kind of labor contracts. In addition, there is no evidence that there are differences in labor demand, whether only members of the owner family serve as business executives or not.

The parameter estimates for the fractional panel probit model mainly confirm the results for the random effects regressions. Once more, the outcome for the IMR in highly significant in all cases. In addition, the parameters for the interaction variable between log. of wages per capita respective log. of Euribor and family dummies are again significant and positive. Moreover, the effect of value added on labor demand is significantly lower, when we look at establishments with working owners. The dummy variable that indicates whether owners act exclusively or partly as business executives becomes significantly negative, indicating that those firms are generally smaller compared to other establishments. The parameters for interaction variables between family firms and the share of temporary employed are now insignificant. Some other significant differences for the labor demand of family firms become apparent for the shares of workers subject to the social security scheme, female workers and low-skilled workers.

	(a) Owners working in company	(b) Exclusively managed by owners	(c) Exclusively or partly managed by owners
Log. of wages (non family firms)	-0.189 (0.013)	-0.162 (0.016)	-0.190 (0.019)
Log. of wages (family firms)	-0.159 (0.027)	-0.103 (0.033)	-0.116 (0.038)
Log. of capital costs (non family firms)	-0.051 (0.007)	-0.004 (0.006)	-0.008 (0.006)
Log. of capital costs (family firms)	-0.046 (0.013)	-0.001 (0.011)	0.000 (0.013)
Log. of value added (non family firms)	0.658 (0.005)	0.638 (0.008)	0.628 (0.008)
Log. of value added (family firms)	0.641 (0.009)	0.627 (0.016)	0.614 (0.016)

Table 7*: **Average Elasticities from the RE Estimations in Table 5, Average standard deviation in parenthesis***

[2] Regressions without IMR as additional variable are available from the author

	(a) Owners working in company	(b) Exclusively managed by owners	(c) Exclusively or partly managed by owners
Log. of wages (non family firms)	-0.543	-0.521	-0.552
Log. of wages (family firms)	-0.513	-0.463	-0.464
Log. of capital costs (non family firms)	-0.037	-0.008	-0.013
Log. of capital costs (family firms)	-0.026	-0.002	-0.001
Log. of value added (non family firms)	0.861	0.821	0.824
Log. of value added (family firms)	0.851	0.822	0.815

Table 8: ***Average Elasticities from the Fractional Panel Probit Estimations in Table 6***

Tables 7 and 8 contain the calculated average elasticities for η_{Lw}, η_{Lr} and η_{LY} from the estimates in Tables 5 and 6. The elasticities for wages and value added have the expected signs, but the results for the RE estimations are rather small compared to the other results for Germany. In particular, the wage elasticity in Table 7 indicates that doubling the wage per capita would reduce labor demand by only 20%. One possible explanation could be that an increase in remuneration also leads to substitution effects within the establishment's wage force, e.g. if the low-skilled workers experience increasing wages, they will possibly be replaced by highly skilled workers, so that employment effects of higher wages are smaller. However, Lichter et al. (2014) state that previous results of wage elasticities are probably upwardly inflated, and therefore, the estimated values are not elusive. Compared to Table 7, the average elasticities for wages and value added in Table 8 are larger in absolute values. Next to the different estimation strategies, this is possibly due to the methods of calculation of the elasticities (see Section 4). In both tables, the calculated elasticities for the family firms have smaller absolute values. This means that the labor demand of family firms is less influenced by economic changes and therefore becomes a possible source of economic stability through a business cycle.

This different behavior can be explained by several reasons. Firstly, the owner family is probably not primarily interested in short-run profit maximization. Secondly, owners are likely to extend employment opportunities to other members of the family, even if there is no or only a weak economic reason to do so. One possible goal could be the long-run existence of the firm to secure their lifetime income or to leave the firm to the next generation. Executives in small establishments are also more likely to show different behavior, because, as owners and managers, they are more easily identified with the company and its actions. In addition, if the size of the outside capital increased with firm size, then larger firms are forced to look for profits. Therefore, the previous analysis is repeated with a restricted sample of establishments with 20 or more employees. Table 9 and 10 contain the results of the regressions.

In Tables 9 and 10, the parameters for IMR are still highly significant, but most of the gaps between family firms and other establishments vanish. No significant parameters for the influence of wages or demand occur. It seems that there are some indications for differences in Lr. As other establishments are likely to show a substitutional relationship between labor and capital, the effect for family firms is almost zero. Compared to the former analysis, some parameters for the employment structure and the dummy for family firms in the first column of Table 10 are again significant. The calculated elasticities are comparable to the results in Tables 7 and 8. The calculated elasticities are available from the author. The results from Tables 9 and 10 suggest that most of the differences in the labor demand of family and non-family firms are explained by the establishment size. Larger family firms act almost like their competitors who exhibit other ownership structure. This is probably due to the stronger use of outside capital and/or the higher competition, which calls for the application of economic principles in the short run instead of looking for the long-run existence of the company. In addition, the results do not confirm the assumption of an implicit employment protection in family firms. Moreover, the results indicate that capital costs are more or less irrelevant for the overall labor demand of family

firms. Other establishments show a substitutional relation between capital and a firm's total employment. The subsequent section provides a summary of the analysis and concludes.

	(a) Owners working in company	(b) Exclusively managed by owners	(c) Exclusively or partly managed by owners
Dummy for family firms	-0.315 (0.183)	-0.435 (0.319)	0.052 (0.320)
Log. of wages per capita	1.034** (0.023)	1.194** (0.025)	1.182** (0.030)
Dummy for family firms • log. of wages per capita	0.044 (0.024)	0.058 (0.031)	-0.011 (0.035)
Log. average 12-month Euribor	-0.043** (0.011)	-0.008 (0.008)	-0.010 (0.009)
Dummy for family firms • log. average 12-month Euribor	0.012 (0.010)	0.017 (0.009)	0.017 (0.010)
Log. of value added	-0.421** (0.010)	-0.395** (0.013)	-0.417** (0.015)
Dummy for family firms • log. of value added	-0.008 (0.007)	0.022 (0.015)	0.014 (0.014)
Share of part-time workers	-0.117 (0.069)	-0.156** (0.059)	-0.210** (0.066)
Dummy for family firms • share of part-time workers	-0.048 (0.068)	-0.167* (0.075)	-0.178* (0.073)
Share of temp. Employed	0.440** (0.074)	0.568** (0.080)	0.565** (0.096)
Dummy for family firms • share of temp. Employed	0.031 (0.083)	-0.225* (0.104)	-0.283** (0.109)
Share of employed persons subjected to the social insurance scheme	0.114 (0.105)	0.263* (0.132)	-0.051 (0.150)
Dummy for family firms • Share of employed persons subjected to the social insurance scheme	0.138 (0.104)	-0.210 (0.179)	-0.119 (0.190)
Share of female workers	-0.007 (0.045)	0.098 (0.057)	0.079 (0.063)
Dummy for family firms • share of female workers	0.103* (0.043)	0.079 (0.064)	0.093 (0.064)
Share of low skilled workers	0.317** (0.033)	0.195** (0.036)	0.201** (0.042)
Dummy for family firms • share of low skilled workers	0.026 (0.035)	0.002 (0.049)	0.003 (0.051)
Overall R^2	0.4825	0.5173	0.5043
Wald-Test χ^2 (df.)	14,832** (91)	7,652** (78)	7,162** (78)
Breusch/Pagan-Test $\chi^2(1)$	36,359**	13,787**	13,728**
Obs. (Establ.)	49,869 (17,967)	20,986 (7,284)	20,986 (7,284)

Table 9: ***Random Effects Panel Estimation of Differences in Labour Demand of Family and Non-Family Firms with at least 20 Employees and Selectivity*** **(IAB Establishment Panel 2001 - 2013.)**

*Note: The model also includes the following dichotomous and auxiliary variables: constant, inverse Mills ratio, dummy for Western Germany, dummy for coverage by a collective agreement, establishment size (seven dummies), firm profitability (eight), industry (fourty), year (seventeen). Robust standard errors adjusted for clustering on establishments in parentheses. ** and * denote significance at the .01 and .05 levels, respectively.*

	(a) Owners working in company	(b) Exclusively managed by owners	(c) Exclusively or partly managed by owners
Dummy for family firms	-0.359* (0.152)	-0.397 (0.239)	-0.092 (0.232)
Log. of wages per capita	0.689** (0.032)	0.773** (0.042)	0.761** (0.044)
Dummy for family firms • log. of wages per capita	0.039 (0.022)	0.050 (0.027)	0.031 (0.029)
Log. Average 12-month Euribor	-0.043** (0.010)	-0.011 (0.008)	-0.018* (0.009)
Dummy for family firms • log. average 12-month Euribor	0.018 (0.009)	0.013 (0.009)	0.021* (0.009)
Log. of value added	-0.189** (0.010)	-0.213** (0.015)	-0.213** (0.016)
Dummy for family firms • log. of value added	0.003 (0.006)	0.006 (0.011)	-0.009 (0.010)
Share of part-time workers	-0.258** (0.049)	-0.280** (0.057)	-0.309** (0.062)
Dummy for family firms • share of part-time workers	0.030 (0.048)	-0.132* (0.061)	-0.120 (0.065)
Share of temp. Employed	0.158** (0.052)	0.191** (0.063)	0.195** (0.068)
Dummy for family firms • share of temp. Employed	0.014 (0.053)	-0.084 (0.070)	-0.136 (0.070)
Share of employed persons subjected to the social insurance scheme	0.107 (0.085)	0.010 (0.118)	-0.104 (0.125)
Dummy for family firms • Share of employed persons subjected to the social insurance scheme	0.059 (0.082)	-0.047 (0.099)	-0.028 (0.107)
Share of female workers	0.050 (0.041)	0.005 (0.063)	0.007 (0.065)
Dummy for family firms • share of female workers	0.009 (0.033)	0.143** (0.045)	0.108* (0.047)
Share of low skilled workers	0.098** (0.030)	-0.004 (0.035)	-0.008 (0.038)
Dummy for family firms • share of low skilled workers	0.024 (0.032)	0.078* (0.037)	0.067 (0.038)
Log. Pseudolikelihood	-27,116	-11,343	-11,355
Wald-Test χ^2 (df.)	6,363** (272)	3,738** (259)	3,578** (259)
Obs. (Establ.)	49,869 (17,967)	20,986 (7,284)	20,986 (7,284)

Table 10: ***Fractional Panel Probit Estimation of Differences in Labour Demand of Family and Non-Family Firms with at least 20 Employees and Selectivity*** **(IAB Establishment Panel 2001 - 2013.)**

*Note: The model also includes the following dichotomous and auxiliary variables: constant, inverse Mills ratio, dummy for Western Germany, dummy for coverage by a collective agreement, establishment size (seven dummies), firm profitability (eight), industry (fourty), year (seventeen), the mean of time variant explanatory variables, dummies for the number of observations for an establishment and interaction variables between the means and the dummies. Semi-robust standard errors adjusted for clustering on establishments and years in parentheses. ** and * denote significance at the .01 and .05 levels, respectively. The STATA option „cluster" is used to calculate the clustered sandwich estimator to obtain a robust variance estimate that adjusts for within-cluster correlation. The STATA code to estimate the fractional panel probit model is provided in Wooldridge (2011).*

5 Conclusions

This study analyses differences in labor demand between family and non-family firms. Therefore, a translog cost function is used to derive the structural model of labor demand. This model is estimated with a German establishment panel data from 2001 to 2013 and two different estimation strategies: a conventional random effects estimation, where a log-odds transformation is applied to the dependent variable and a fractional panel probit regression that overcomes the problems of a log-odds transformation. In addition, there is some selectivity in the observations of family firms. Therefore, a Heckman correction is introduced to the estimations.

The empirical results show that the observation of family firms is more likely when lower wages are paid and the establishments' turnover are smaller. Moreover, the results of the labor demand estimation with the complete data indicate that wage and output elasticities are smaller in absolute values. This result would support the assumption that family firms offer implicit employment contracts, where a higher job security is related to a lower wage level. We would also expect these results when family firms are more risk averse than other entities (cf. Sraer & Thesmar 2007, Bassanini et al. 2013, Bjuggren 2015).

Nevertheless, there are some arguments regarding why small family firms act different than large ones. Among other causes, there could be greater competition between larger firms and the use of outside capital, higher identification of owners of small firms with their company and the desire of the owners to hand the firm over to a heir. In addition, there is some empirical evidence that the performance of family firms also depend on firm size (Miller et al. 2013).

When the data is restricted to establishments with 20 or more employees, all parameter estimates indicating differences in wage or output elasticities become insignificant. This implies that larger family firms have the same labor demand behavior compared to other privately held businesses and suggests that only very small establishments with less than 20 employees offer implicit employment contracts respectively show a higher risk aversion. As this result is rather new in the literature, further investigations should prove this outcome. Especially, future research should therefore address the selectivity in the observations of family firm data.

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