Accounts receivable management and the factoring option: Evidence from a bank-based economy[*]

Thomas Hartmann-Wendels[†]   Alwin Stöter[‡]

Abstract: We analyze a firm's decision of whether to manage trade credits internally, use full-service factoring or enter into an in-house factoring contract. Our model is primarily based on a theory of the firm that stresses a supplier's need for financing, risk and financial flexibility. We find that high-risk firms with a strong need for short-term financing and restricted access to bank credit are more likely to use factoring. Larger firms typically prefer in-house factoring, whereas smaller firms tend to rely on full-service factoring. The firm's desire to attain independence from banks plays an important role in decisions regarding factoring.

JEL classification: G32

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1 Introduction

In interfirm-trade, selling firms must decide whether buying firms must pay for merchandise immediately or whether payments may be obtained over the course of a specified period of time. In the common situation of trade credit financing the seller must also decide how to finance and operate the accounts receivable that are generated by the extension of trade credit to buyers. The management of accounts receivable can either be organized within the firm or delegated to a specialized financial intermediary, such as a factor.[1] In this study, we examine the decision between the internal management of accounts receivable and the use of factoring.

Accounts receivable constitute a significant portion of companies' balance sheets, highlighting the importance of the management and financing of this type of asset.[2] The extension of trade credit requires the assignment of five functional responsibilities: (1) customers' credit risks must be assessed, (2) the decision to grant trade credit must be made (including the establishment of credit terms and limits), (3) the trade credit must be collected, (4) the default risk must be borne and (5) the receivable must be financed until it has been paid by the purchaser (see Mian and Smith Jr. (1992)). In full-service factoring contracts, all of these credit management functions are performed by a factor, whereas firms that use in-house factoring (which is also known as invoice discounting) manage the accounting and collection of their accounts receivable on their own.[3]

Factoring is increasing in prominence as a financial source for firms that are based in Germany. Data from the German Factoring Association and the German Federal Factoring Association for Medium-Sized Businesses indicate that the sales of German factoring companies have increased by more than 400%, rising from 30 billion euro in 2001 to 160 billion euro in 2011, which indicates that over 5% of the German GDP was financed through factoring.[4]

However, theoretical and empirical studies on the determinants of firms' accounts receivable management are rare. In a seminal work, Mian and Smith Jr. (1992) analyze the choice of accounts receivable from a primarily theoretical point of view. Their study distinguishes among general corporate credit, accounts receivable secured debt, captive finance

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[1]We emphasize that in analyzes of the decision to factor, it is important to consider the services that are included in the factoring contract. We use the term factoring to encompass both full-service factoring and in-house factoring; to specify a particular type of factoring, we use the specific individual terms.

[2]The average ratio of accounts receivable to assets is 30-40% in our sample and 35% in the UK as a whole (see Summers and Wilson (2000)).

[3]The credit terms of existing customers generally remain the same, but the terms for the granting of trade credit to new customers must be negotiated with the factor if the new accounts receivable are to be transferred to the factor. Overviews of the factoring contracts can be found in Smith and Schnucker (1994), Lea and Trollope (1996) and Hawkins (1993).

[4]The German Factoring Association and the German Federal Factoring Association for Medium-Sized Businesses include 44 factoring companies as members; in combination, these companies represent over 85% of the German factoring market.

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subsidiaries and factoring. These researchers are unable to test the majority of the hypotheses that they develop due to data limitations of their accounting-based sample of US firms. Because factoring is not comprehensively reported in financial statements, accounting-based data systematically understate the use of factoring. Therefore, recent empirical studies rely on surveys to acquire data. Smith and Schnucker (1994) regard the decision to employ a factor as a choice of whether to vertically integrate the trade credit functions. Consequently, their model focuses on information and monitoring costs. Their results are replicated by Summers and Wilson (2000), who investigate factoring in the context of the UK; Summers and Wilson (2000) also examine the roles of the demand for short-term financing and the preferences of factors as determinants of the use of factoring. Klapper (2006) analyzes the determinants of the provision of factoring services across different countries.

According to data from the International Factor Group, in-house factoring produces over 80% of factoring revenues in both Germany and the UK, whereas full-service factoring accounts for 16% of factoring revenues in Germany and 11% of factoring revenues in the UK. However, the aforementioned academic papers do not consider in-house factoring. In these papers, firms that use in-house factoring are either excluded from the examined sample or treated similarly to firms that do not use factoring at all; this type of treatment produces biased estimated coefficients in the corresponding models.

Our study provides two major contributions to the existing literature. First, we incorporate the use of in-house factoring into multinomial models in which firms decide between internal accounts receivable management, in-house factoring and full-service factoring. Second, we examine the risk and the financial flexibility of the supplier as determinants of the decision to employ a factor. Our empirical analysis is based on the responses to a detailed large-scale survey about the characteristics of non-financial German firms and the policy choices of these firms with respect to accounts receivable management. To ensure that our study is not biased towards large listed companies, the sample that is used in this study includes small, medium-sized and large companies that are spread across several industries.[5]

In Section 2, we discuss the determinants of accounts receivable management policy choices. The presented hypotheses are developed from theories that relate to transaction costs, economies of scale, financial needs, suppliers' risks, financial flexibility and industry sector. In Section 3, we describe the data of this study and present various summary statistics regarding the surveyed firms. In Section 4, we perform univariate and multivariate regression analyzes of the use of full-service factoring and in-house factoring. In addition, we discuss the reasons that firms provided in our survey for their use or avoidance of factoring options. Section 5 presents the conclusions of this study.

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[5]Both the securitization of accounts receivable and the formation of captive finance subsidiaries are neglected in our study because these financial instruments are not available to small and medium-sized companies in Germany.

Table 1: The Determinants of Accounts Receivable Management

This table presents testable hypotheses with respect to the effects of the listed determinants on the listed alternative accounts receivable management choices. In the table, + entries indicate determinants that produce an increased predicted probability of factoring, - entries indicate determinants that produce a decreased probability of factoring, and 0 entries indicate determinants with no effect on a particular factoring decision.

	In-House Factoring	Full-Service Factoring
Transaction Costs		
Number of buyers that are offered trade credit	+	+
Number of industries that are served	+/-	+/-
Economies of Scale		
Size (sales)	+	-
Financial Needs		
Percentage of the credit line that is used	+	+
Accounts receivable / Assets	+	+
Net income	-	-
Funding requirements of current assets	+	+
Seller's average redemption period	+	+
Effective average collection period	+	+
Risk / Financial health		
Equity / Assets	-	-
Seller's interest rates on current debt	+	+
Seasonality of the seller's sales	+	+
Financial Flexibility		
Seller's dependence on banks	+	+

2 The Determinants of Accounts Receivable Management

In the following subsections, we review and extend the existing theories regarding the decision to employ a financial intermediary for accounts receivable management. Table 1 summarizes the hypotheses that are developed from the theories that are presented below.

2.1 Transaction Costs

Smith and Schnucker (1994) examine the decision to factor as a choice between vertically integrating trade credit functions or using a specialized contract with an external firm. The vertical integration theory suggests that in markets with imperfect information, contracts serve the purpose of reducing transaction costs (see Coase (1937)). Information costs and monitoring costs arise for both buyers and sellers during the selling process. The buyers must value the delivered products or services, and the seller must collect information regarding the creditworthiness of the buyer. Factors act as an information sources for the supplier and the customers. If a factor deals with multiple different sellers that have large overlaps in their customer bases, the intermediary has a cost advantage over the seller because the

factor can deliver information about a single customer to several suppliers. We identify two dimensions of customer concentration: (1) the number of customers that are offered trade credit and (2) the number of industries among which these customers are distributed. A firm that sells its product to a greater number of buyers on credit will reap greater benefits from externalizing its trade credit functions because the involvement of more buyers renders it more likely that a factor would already have existing credit information regarding a subset of these buyers. We include a variable that measures the number of customers that a seller serves and expect this variable to display a positive relationship with factoring tendencies. A supplier will also derive greater benefits from using a factor if it serves a greater variety of different industries. However, factors must balance diversification across industries with the costs of obtaining additional industry-specific knowledge. We account for the distribution of customers with respect to different industries in our empirical analysis. The sign of the coefficient of this variable may be either positive or negative, depending on which of the effects that are described above proves to be predominant.

2.2   Economies of Scale

Large economies of scale are produced by the high fixed costs that are associated with trade credit functions. In an in-house factoring contract, the accounting and the credit collection are managed within the firm, whereas credit insurance and the financing of accounts receivable are provided by the intermediary. In full-service factoring, all of the aforementioned services are performed by the factor. A larger firm is more likely to have the capability to internally manage its accounts receivable in a cost-efficient manner. Mian and Smith Jr. (1992) argue that compared with smaller firms, larger firms are expected to invest in more highly skilled credit administration personnel and more sophisticated IT-systems. Therefore, we expect the advantages of externalizing trade credit functions to be larger for small firms than for large firms. Moreover, as a requirement for providing in-house factoring, a factor typically requires companies to demonstrate that they have a sufficiently sophisticated accounting system. Therefore, in-house factoring is often an option that is only offered to firms with a certain minimum quantity of sales. We include a variable for firm size; this variable is measured in terms of sales. We predict a negative sign for the coefficient of the size variable for full-service factoring and a positive sign for the coefficient of this variable with respect to in-house factoring.

2.3   Financial Needs

For the decision of how to finance accounts receivable, the firm weighs the costs and assesses the availability of different financial instruments. We suggest that factoring is more likely for firms that possess a strong need for financing. We measure the need for financing by the firm's funding requirements for its current assets and hypothesize the existence of a positive relationship between financing needs and factoring.

German banks seldom provide credit that is secured with accounts receivable. Summers and Wilson (2000) argue that compared with suppliers, the factors experience less difficulty in protecting the accounts receivable that they possess because the trade credit functions that relate to these accounts receivable are also delegated to the factors. We expect a high ratio of accounts receivable to total assets to increase the likelihood that a firm will employ a factor.

When a firm enters into a factoring contract, the immediate liquidity that the firm obtains can be used to mitigate its cash flow problems. A greater quantity of a firm's accounts receivable can typically be involved in a factoring contract than in the context of securing bank credit. Therefore, a firm will typically realize more cash from its accounts receivable through factoring than it could obtain through bank loans involving these accounts receivable. This phenomenon likely occurs because the seller must reveal all of its invoices to the factor. Moreover, compared with a bank, a specialized factor may also be more capable of protecting the value of these invoices. We include two variables that model potential cash flow problems of the supplier: (1) net income and (2) the average days that a seller requires to pay off its debts. We predict that the use of factoring will be negatively related to net income and positively related to the seller's average redemption period.

Because factors may have a more efficient dunning process than sellers, the use of factors may also help to improve customers' payment behaviors, thereby making the full value of a seller's accounts receivable (less fees) available to the seller at an earlier time. Summers and Wilson (2000) state that a factor can place more pressure on customers to pay early, given that buyers that delay in paying their obligations to a factor could experience reduced creditworthiness with several different suppliers. We include a variable that measures the average days that customers require to pay off their trade credits. We hypothesize that factoring is more likely for firms with lengthy average collection periods.

Firms that are credit-rationed by the banking sector may not be able to finance their accounts receivable through a bank credit. A firm that is facing this type of scenario is more likely to employ a factor. We incorporate the percentage of the credit line that a seller has used into our empirical analysis and expect to find a positive coefficient for this variable for both full-service and in-house factoring.

2.4   Risk / Financial Health

The factoring contract provides full insurance for a firm's accounts receivable. Therefore, firms that are vulnerable to bad debt are more likely to enter into a factoring contract. Moreover, because a factoring relationship involves the sale of accounts receivable to a factor, a high-risk seller is effectively able to borrow funds based on the creditworthiness of its high-quality buyers. We include two variables that account for the financial health of the seller: (1) the equity ratio and (2) the interest rates on current debt. We predict that a higher equity ratio reduces the probability of using factoring.

The existence of higher interest rates on current debt is expected to increase the probability of employing a factor.

Pike and Cheng (2001) argue that firms with seasonal sales are more likely to engage in riskier trade credit arrangements to stimulate their sales. Therefore, we expect these types of firms to be more likely to utilize various risk reduction policies, such as factoring. We incorporate a variable that measures the seasonality of a firm's sales into our model and hypothesize that this variable is positively related to the use of factoring.

2.5   Financial Flexibility

In several US and European surveys, CFOs were asked to identify important factors that influence their financing decisions (see Graham and Harvey (2001), Bancel and Mittoo (2004), Brounen et al. (2004)). These studies find that corporate executives place significant value on having financial flexibility. Byoun (2007) defines financial flexibility as "the degree of capacity and speed at which the firm can mobilize its financial resources in order to take reactive, preventive and exploitive actions to maximize the firm value."[6] In Germany, small firms are frequently particularly dependent on a house bank and therefore face the risk of being unable to either finance future opportunities or to obtain liquidity during times of financial distress. During the financial crisis, banks were unable or unwilling to provide financing, encouraging firms to seek alternative financing instruments. Factoring can be used as an instrument for financial diversification that mitigates the threat of future financial constraints. Therefore, we expect that firms that are dependent on a house bank are more likely to employ a factor. We measure a firm's dependence on banks with a dummy variable that is set equal to one if the firm has a business relationship with only one bank and zero otherwise.

2.6   Industry Sector

Factoring practices may be more traditional and established in certain industries, e.g., textiles; therefore, firms in these industries will be more likely to use factoring. Furthermore, factors' preferences may not be attained by certain industries. For instance, in the construction industry, accounts receivable are only factorable to a limited degree because the goods and services that have been purchased often have not completely been delivered.

2.7   Full-Service Factoring vs. In-House Factoring

In-house factoring presents two major advantages over full-service factoring. First, the seller is able to individually react to customers that pay late, thereby preventing the deterioration of the customer-supplier relationship for these customers. Second, because in-house factoring involves direct payments from the customers to the seller, these customers are not

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[6]See Byoun (2007), p. 2.

Table 2: Summary Statistics of the Independent Variables

This table presents the means and standard deviations of the explanatory variables. The variables of the *Seller's average redemption period* and *Effective average collection period* are winsorized at the 99th percentile. The sample consists of 736 non-financial German firms that responded to a survey that was conducted in 2010. Descriptions of the categorial variables can be found in the Appendix.

	Variable Type	Mean	Std. Dev.
Transaction costs			
Number of buyers that are offered trade credit	Categorial	4.4593	1.5809
Number of industries that are served	Categorial	2.5109	1.1344
Economies of scale			
Size (sales)	Categorial	3.5557	1.9116
Financial needs			
Percentage of the credit line that is used	Categorial	2.9565	1.8349
Accounts receivable / Assets	Categorial	3.0666	1.4015
Net income	Categorial	1.5380	0.9411
Funding requirements of current assets	Categorial	2.2133	1.3907
Seller's average redemption period	Continuous	25.2194	15.6186
Effective average collection period	Continuous	33.6141	15.4177
Risk / Financial health			
Equity / Assets	Categorial	2.9932	1.5912
Seller's interest rates on current debt	Categorial	2.7106	0.9920
Seasonality of seller's sales	Categorial	3.4198	1.1341
Financial Flexibility			
Seller's dependence on banks	Dummy	0.1685	0.3745

aware that the supplier has sold its accounts receivable to an intermediary entity. This characteristic may represent an advantage for situations in which engaging a factor is interpreted as a signal of financial distress. In these types of scenarios, buyers may become reluctant to buy the products or services of the seller because the ability of the seller to supply and maintain products in the future is not secure.

3   Data and Summary Statistics

The data that were used for the empirical analysis of the current study are obtained from firms that responded to a mail survey that was conducted throughout Germany in April and September of 2010 in cooperation with the German Factoring Association.[7] The survey consists of two components: the first component requested detailed information regarding a firm's characteristics and credit management policy, whereas the second component contains qualitative questions about various topics, including reasons for using or avoiding factoring. The survey was sent to over 17,000 firms. In total, 1,444 companies returned the survey, a response rate of 8.3 percent. We restrict the sample to non-financial firms that exhibited no missing values for the dependent and explanatory variables that were considered in this

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[7]The survey was submitted again in September 2010 to reach firms that did not use factoring.

study. After applying these constraints, 736 firms remain in the sample. In total, 167 (22.7%) of the sampled firms use full-service factoring, 255 (34.6%) of the sampled firms use in-house factoring and 314 (42.7%) of the sampled firms use no factoring. Details regarding the survey may be obtained from the authors upon request.

Table 2 provides certain summary statistics for the explanatory variables of this study. The continuous variables of *Seller's average redemption period* and *Effective average collection period* are winsorized at the 99th percentile to mitigate the effects of extreme values. The independent variables exhibit reasonable variation, indicating that the sample covers a wide range of companies with different firm characteristics. The dependent variable for this study has three values: 0, which represents no use of factoring; 1, which represents the use of in-house factoring; and 2, which represents the use of full-service factoring.

4 Results

To obtain an understanding of the relationship between the explanatory variables and the use of either full-service factoring or in-house factoring, we first conduct a univariate analysis. In the second part of this section, we perform a multinomial logistic regression based on the theoretical model that is explained above. The third part of this section discusses firms' reasons to use or avoid factoring.

4.1 Univariate Results

Table 3 presents the results of the univariate analysis. The means of the explanatory variables for the three categories, (1) the internal management of the trade credit functions, (2) the use of in-house factoring and (3) the use of full-service factoring, were calculated to analyze the differences between these statistics. We perform a t-test to assess whether the differences in the means of the independent variables for these three categories are statistically significant.

4.1.1 Transaction Costs

The results for the variables that relate to transaction costs are in accordance with the developed hypotheses. Companies that externalize their trade credit management offer trade credit to more customers. This relationship is statistically significant for firms that use in-house factoring. Companies that use in-house factoring also serve significantly fewer industries. In addition, there is a negative relationship between the use of a factor and the number of industries that the seller serves; however, this relationship is not statistically significant. On the whole, the results indicate that factors prefer to work with companies with customers that are concentrated in only a few industries. Moreover, factors that serve firms that sell to several different buyers are more likely to benefit from customer overlaps. This benefit which

Table 3: The Univariate Results

This table shows the mean values of the explanatory variables for the three categories of the dependent variable. The sample consists of 736 non-financial German firms that responded to a survey that was conducted in 2010. The variables of the *Seller's average redemption period* and *Effective average collection period* are winsorized at the 99th percentile. Differences to the base category of internal management of the accounts receivable that are statistically significant at the 1%, 5% and 10% levels are marked with ***, ** and *, respectively. Descriptions of the categorial variables can be found in the Appendix.

	Internal Management (Mean)	In-House Factoring (Mean)	Full-Service Factoring (Mean)
Transaction costs			
Number of buyers that are offered trade credit	4.2378	4.7689 +**	4.4028 +
Number of industries that are served	2.6338	2.3294 - ***	2.5569 -
Economies of scale			
Size (sales)	3.1051	4.6549 +***	2.7246 - **
Financial needs			
Percentage of the credit line that is used	2.3217	3.4627 +***	3.3772 +***
Accounts receivable / Assets	2.7357	3.4627 +***	3.0838 +**
Net income	1.5191	1.7137 +**	1.3054 - ***
Funding requirements of current assets	1.6911	3.0549 +***	1.9102 +*
Seller's average redemption period	20.9628	29.1542 +***	27.2145 +***
Effective average collection period	30.5510	35.7961 +***	36.0419 +***
Risk / Financial health			
Equity / Assets	3.3153	2.8706 - ***	2.5749 - ***
Seller's interest rates on current debt	2.6465	2.5961 -	3.0060 +***
Seasonality of the seller's sales	3.4427	3.4431 +	3.3413 -
Financial Flexibility			
Seller's dependence on banks	0.1592	0.1020 - **	0.2874 +***
Observations	314	255	167

produces transaction cost advantages for these factors. Therefore, companies with many clients are more likely to use factoring.

4.1.2   Economies of Scale

Firm size has an effect on the use of full-service factoring versus in-house factoring. As predicted, firm sales are positively related to in-house factoring and negatively related to full-service factoring, providing support for the importance of economies of scale. Although smaller firms benefit from transferring the management of their debtors to a factor, larger firms are willing to manage the accounting and credit collection of their accounts receivable.

4.1.3 Financial Needs

We find strong support in the univariate results for the impact of the need for financing on the decision to use either full-service factoring or in-house factoring. Firms that have used a high percentage of their credit lines are more likely to engage a factor. Both a high ratio of accounts receivable to assets and larger *Funding requirements of current assets* produce a higher probability of using full-service factoring or in-house factoring. Moreover, firms that sell their accounts receivable to a factor extend trade credit for a longer period of time and are slower to pay off their debt. The results for the measurements of the cash flow that is available to a firm are somewhat mixed. The sign of the *Net income* variable is significantly negative for the use of full-service factoring, as expected. However, significantly greater quantities of cash are available to firms that enter an in-house factoring contract than to firms that manage their trade credit management internally. This relationship appears to be spurious; large firms are more likely to have a high *Net income* , and this correlation produces a positive sign for the *Net income* variable in a univariate analysis.

4.1.4 Risk / Financial Health

The equity ratio is negatively correlated with the use of full-service factoring and the use of in-house factoring, providing support for the risk-related theory regarding factoring. The interest rates on current debt are significantly higher for companies that use full-service factoring; however, this type of result is not obtained with respect to in-house factoring. Moreover, this finding may be related to the larger size of firms that use in-house factoring. We find that the seasonality of a firm's sales does not appear to affect decisions to externalize trade credit management.

4.1.5 Financial Flexibility

The univariate results demonstrate that the dependence on a house bank is significantly negatively related to full-service factoring, providing support for the theory that firms seek financial diversification through their entry into factoring contracts. Firms that use in-house factoring are more likely to have business relationships with more than one bank. This finding may simply reflect the fact that larger firms have greater access to institutional finance.

On the whole, the correlation of several explanatory variables with firm size in the univariate analysis indicates the need for a multivariate analysis, which is performed in the next section.

4.2 Multivariate Results

Because the dependent variable in this study only assumes the values of 0, 1 and 2, estimations of the model using OLS would produce heteroscedasticity in the error terms and could generate estimations that lie outside the (0,2) interval. Therefore, we use a multinomial logistic regression model for the multivariate analysis. The logistic regression

approach assumes a linear relationship between the natural logarithms of the odds of an event (called the logits) and the explanatory variables:

$$\ln\left(\frac{P_i(Y_i = j)}{P_i(Y_i = 0)}\right) = \alpha_j + \beta_j \cdot \mathbf{X}_i \tag{1}$$

where $j = 1$ and $j = 2$ represent the events of using in-house factoring and full-service factoring, respectively, and $\mathbf{X}_i$ is the vector of the explanatory variables.[8] Therefore, the probability of using full-service factoring and in-house factoring is described by the following logistic function:[9]

$$P_i(Y_i = j) = \frac{e^{\alpha_j + \beta_j \cdot \mathbf{X}_i}}{1 + e^{\alpha_1 + \beta_1 \cdot \mathbf{X}_i} + e^{\alpha_2 + \beta_2 \cdot \mathbf{X}_i}}. \tag{2}$$

The probability of using neither full-service factoring nor in-house factoring can be expressed as follows:

$$P_i(Y_i = 0) = \frac{1}{1 + e^{\alpha_1 + \beta_1 \cdot \mathbf{X}_i} + e^{\alpha_2 + \beta_2 \cdot \mathbf{X}_i}}. \tag{3}$$

The coefficients of the independent variables are estimated by the maximum likelihood method. To measure the goodness of fit of the model, we estimate the model's McFadden's R^2 value and the percentage of observations that the predicted model classifies correctly.

We model the decision regarding different forms of accounts receivable management as a function of several variables; these variables reflect transaction costs, economies of scale, financial needs, the supplier's risk and the supplier's financial flexibility.

Table 4 presents the results of the multivariate regressions. Columns (1) and (2) report the logit estimates of the model that is described above without controlling for the industry. The pseudo R^2 of the estimated model is approximately 20 percent. In a comparison of the predicted use of full-service factoring and in-house factoring with the observed values, 62 percent of the observations are classified correctly. These two statistics indicate that the model fits the data well. The included variables are also jointly statistically significant.

The coefficients of the variables that are related to transaction costs have the expected signs; this result is consistent with the univariate findings. The variable of *Number of buyers that are offered trade credit* is significantly and positively related to factoring, indicating that as more customers are offered trade credit, a greater benefit is generated from

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[8]We do need to estimate the logit values for the decision to use full-service factoring and not to use in-house factoring; these values can be expressed as the difference between $j = 1$ and $j = 2$ for Equation 1.

[9]Smith and Schnucker (1994) use a probit model to empirically analyze the decision to factor. The probit model is based on the assumption of a normal distribution. As a robustness assessment, we also conduct probit model regressions, but the results of this model are essentially the same as the results that are already presented in the text.

Table 4: The Multinomial Logistic Regression Results

This table presents the results for the multivariate logistic regressions. The base category is the internal management of the accounts receivable. The sample consists of 736 non-financial German firms that responded to a survey that was conducted in 2010. The variables of the *Seller's average redemption period* and *Effective average collection period* are winsorized at the 99th percentile. In Model B, industry dummies (which are unreported) are included in the regression equation. The coefficients that are statistically significant at the 1%, 5% and 10% levels are marked with ***, ** and *, respectively. Descriptions of the categorical variables can be found in the Appendix.

	Model A		Model B	
	(1) In-House Factoring	(2) Full-Service Factoring	(3) In-House Factoring	(4) Full-Service Factoring
Transaction costs				
Number of buyers that are offered trade credit	0.1204*	0.1565**	0.0252	0.1099
Number of industries that are served	-0.2646***	-0.0784	-0.2798***	-0.1609
Economies of scale				
Size (sales)	0.3495***	-0.2740***	0.3657***	-0.2549**
Financial needs				
Percentage of the credit line that is used	0.1179*	0.1974***	0.1383**	0.2479***
Accounts receivable / Assets	0.1983***	0.1280*	0.2218***	0.1557*
Net income	-0.3420**	-0.0091	-0.2040	0.0282
Funding requirements of current assets	0.4935***	0.3999***	0.4101***	0.3344**
Seller's average redemption period	0.0227***	0.0052	0.0239***	0.0064
Effective average collection period	0.0054	0.0165**	0.0072	0.0141*
Risk / Financial health				
Equity / Assets	-0.1820***	-0.1916***	-0.2145***	-0.2368***
Seller's interest rates on current debt	0.1322	0.1707	0.1429	0.1146
Seasonality of the seller's sales	0.0036	-0.1265	0.0950	-0.0757
Financial Flexibility				
Seller's dependence on banks	0.1597	0.8600***	0.0701	0.7508***
Industry dummies	No		Yes	
Pseudo R^2	0.1988		0.2764	
% Classified correctly	61.69		67.39	
Observations	736		736	

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delegating all of the trade credit functions to a factor. The variable *Number of industries that are served* is significantly and negatively correlated with the use of in-house factoring; therefore, factors prefer suppliers with debtors that are concentrated in only a few industries.

The results for firm size confirm the conclusions that were obtained from the univariate analysis. Firm size is an important factor in the decision to use factoring and in the choice of which different form of factoring to utilize. The probability of delegating all credit functions to the factor is significantly higher for small firms. Through full-service factoring, these firms can benefit from efficiency increases and reduced accounting staff requirements. The significant positive sign of the *Size* coefficient for the use of in-house factoring can be explained by (1) factors' restrictions with respect to the sales of the supplier, (2) the capability of large firms to perform debt collection internally and (3) concerns about customer-relationships.

A seller's availability of and need for financing also play a crucial role in the choice of an accounts receivable policy. All of the variables that are related to this theory have the expected sign and most of these variables are statistically significant. Firms with almost completely utilized credit lines seek alternative financing instruments and use factoring significantly more frequently. Increased values of the size of the collateral and financial requirements of a firm in terms of the firm's ratio of accounts receivable to total assets or the firm's demand for short-term financing significantly increase the probability of employing a factor. In contrast to the findings of the univariate analysis, the coefficient for the *Net income* variable, which measures the cash available to a firm, is significantly negative for firms that use in-house factoring. This result is in accordance with theoretical predictions and differs from the univariate findings because the multivariate model controls for firm size. The hypothesis that firms that require immediate liquidity are more likely to use in-house factoring is also confirmed by the significant and positive relationship between the *Sellers average redemption period* variable and the use of in-house factoring; this relationship is positive but not significant with respect to full-service factoring. Firms with debtors that pay late benefit from the more efficient dunning process of factors that offer full-service factoring. The results for the *Effective average collection period* variable indicate that firms that use in-house factoring already command an efficient collection facility and therefore do not need to delegate their debt collection activities to a factor.

The multivariate results provide support for the risk-related theory. A low ratio of equity to assets significantly increases the probability of entering a factoring contract. This result may occur for two reasons. First, firms that enter into a factoring arrangement benefit from the factor's full insurance of bad debts. Second, firms may be able to use the additional cash that they obtain through factoring to pay down their debt and increase their equity ratio. The coefficient of the *Seller's interest rates on current debt* variable has a positive sign, as expected, but this variable is not statistically

significant. Consistent with the univariate analysis, we do not find evidence that the variable of *Seasonality of seller's sales* affects the decision to use factoring.

As predicted, firms with relationships with only a single bank are more likely to use full-service factoring. This finding supports the theory that factoring is used to diversify the financing portfolio of firms, thereby ensuring that these firms are better prepared to finance future investments or survive during periods of financial distress and credit shortages. In contrast to the results of the univariate analysis, the coefficient of the *Seller's dependence on banks* variable has the expected sign in the multivariate analysis, although this coefficient is not statistically significant.

Columns (3) and (4) present the coefficients of the multinomial logistic regression that includes industry dummies. The signs and significances of the coefficients of the explanatory variables remain essentially the same in this modified regression. The pseudo R^2 increases substantially to 27.64% and the number of correctly classified observations increases by 5.7 percentage points. The (unreported) coefficients of the industry dummies are jointly statistically significant at the 1% level. These findings indicate that the use of in-house factoring and full-service factoring varies somewhat among different industries. This result provides support for the industry-related theory regarding factoring.

The regression approach assumes that the explanatory variables are exogenous. However, the introduction of factoring may influence the independent variables in several ways that could result in biased estimations of the coefficients of the above model. We emphasize that it is important to examine the directions of the possible changes in the explanatory variables that could produce either under- or overestimates of certain coefficients. For instance, factoring may provide the possibility of extending trade credit to new customers; this extension of trade credit may increase the seller's customer base. This phenomenon could subsequently affect the sales and *Net income* of the firm in question. Therefore, the coefficients of these three variables may be overestimated, which could affect the sign and significance of the *Number of buyers that are offered trade credit* variable for both types of factoring contracts and the *Size* variable for the use of in-house factoring (the sign and significance of the other coefficients would remain unchanged).

Furthermore, if the additional cash that is available through a factoring contract is used to pay down debt, the *Percentage of the credit line that is used* by the seller, the *Seller's average redemption period* and the *Seller's interest rates on current debt* may decrease, whereas the seller's equity ratio may increase. In addition, if a firm's accounts receivable are sold to a factor, the firm's ratio of accounts receivable to assets may decrease. However, the signs and significances of the coefficients of these five variables should remain unaffected, as the endogeneity biases would only reduce the absolute size of the coefficients.

We can think of no mechanism by which the *Funding requirements of current assets*, *Seasonality of the seller's sales*

and *Seller's dependence of banks* variables would be affected by this type of endogeneity.

On the whole, we cannot rule out the possibility that endogeneity distorts the estimated coefficients. Therefore, the regression results of the multivariate model must be regarded with caution. However, the rejection of the majority of the tested null hypotheses remains valid given the existence of this type of endogeneity.

4.3 Qualitative Results

The second component of the administered questionnaire contained qualitative questions. Table 5 summarizes the answers to these questions with respect to why the firms (1) use factoring, (2) no longer use factoring and (3) do not use factoring.

Panel A of this table indicates that 95% or more of the firms that use factoring engage in this practice to gain liquidity and to financially diversify their portfolio; this result is consistent with the theories that relate to financial needs and financial flexibility. Furthermore, the second most frequent answer that was provided by survey respondents as a reason that they use factoring is the possibility of decreasing their firm's dependence on banks. The reduction in risk that factoring produces due to increases in a firm's equity ratio is cited as a motivation by more than 54% of the firms that use in-house factoring. Because small and growing firms are more vulnerable to bad debt and are often credit rationed by the banking sector, the full insurance of bad debt and the acquisition of growth financing are other important reasons for the use of full-service factoring.

Panel B reports the answers of the 37 firms in the no-factoring subsample that had previously used factoring. Over 75% of these firms responded that factoring was more expensive than they had expected. Negative feedback from customers, the excessive complexity of implementing factoring and the use of factoring as an interim solution to solve illiquidity problems are also frequently cited reasons for the re-internalization of accounts receivable management by these firms.

Panel C provides reasons for the decision to manage the trade credit functions within a firm. The most frequently stated reasons for this approach are the excessively complicated implementation of factoring, the risk of negative customer feedback from factoring and the high cost of factoring. Surprisingly, one third of the responding firms answered that they had not yet considered factoring as an option for an accounts receivable policy.

Table 5: The Reasons to Use or Avoid Factoring

This table presents the results of the questions about the reasons to use or avoid factoring. The sample consists of 736 non-financial German firms that responded to a survey that was conducted in 2010. The responding firms were allowed to provide multiple answers.

Panel A

	In-House Factoring (in %)	Full-Service Factoring (in %)
Liquidity / Financial diversification	94.86	96.41
Independence from banks	57.31	59.88
Full insurance of bad debt	39.92	55.09
Growth financing	31.62	41.92
Increase in equity ratio	54.55	33.53
Service / Relief of accounting	-	29.34
Possibility of increasing the duration of trade credit	24.51	28.74
Observations	253	167

Panel B

	Former Use of Factoring (in %)
More expensive than expected	75.68
The ongoing process of factoring was overly complicated	37.84
Factoring was only an interim solution during times of illiquidity	27.03
Negative feedback from customers	21.62
Bad experiences with the factor	8.11
Negative feedback from banks	5.41
Observations	37

Panel C

	No Use of Factoring (in %)
Checked, but too expensive	49.61
Factoring has not yet been considered	33.98
Checked, but the risk of negative feedback from customers was too high	25.00
Checked, but the implementation / process of factoring was complicated	17.58
Consultants advised against factoring	6.64
Rejected by factor	0.25
Observations	256

5 Conclusions

In this study, we analyze the determinants underlying the choice of accounts receivable management policies. We develop and test a model in which firms are classified as either internally managing their trade credit, externalizing the majority of the credit functions but maintaining the accounting and debt collection in-house (in-house factoring)

or delegating the entire management of accounts receivable to a factor (full-service factoring). The model considers transaction costs and economies of scale; in addition, it incorporates the financial needs, risks and financial flexibility of the supplier. Statistical evidence is obtained from univariate and multivariate multinomial logistic regression approaches. Furthermore, we analyze the qualitative components of an administered survey in which firms identified their reasons for using or avoiding factoring.

We find that firms use either in-house or full-service factoring if they are in need of short-term financing and wish to diversify their financial portfolio (as measured by their dependence on a house bank). Furthermore, firms also engage in factoring because factors provide full insurance of potential bad debts and because the funds that are generated by factoring allow firms to increase their equity ratios. We also find evidence that firms with many different customers enter a factoring contract to reduce their information and monitoring costs. The main differentiating factor driving firms' choice of accounts receivable management policy is firm size; large firms prefer the control provided by in-house factoring, whereas small, growing firms benefit from the additional relief of accounting requirements that is provided by full-service factoring. On the whole, this study contributes to a better understanding of the factors that affect firms' choices with respect to their accounts receivable policies.

Further research should focus on the seller-buyer relationship and on the problems that are involved in the ongoing implementation of factoring arrangements. It would be highly useful to gather information about all three of the parties that are involved in a factoring contract, i.e., the factor, the seller and the buyer. Iterative surveys could reduce the endogeneity problems that the influence of the introduction of factoring produces on several explanatory variables that relate to factoring decisions.

6 Appendix: Descriptions of the Categorial Variables

Number of buyers that are offered trade credit Product of the number of buyers and one minus the percentage of buyers that pay immediately.

Number of buyers Respondents indicated response as follows:

1-10	11-20	21-50	51-100	101-200	>200
[1]	[2]	[3]	[4]	[5]	[6]

Number of industries that are served Respondents indicated response as follows:

1	2-3	4-6	>6
[1]	[2]	[3]	[4]

Size (sales) Respondents indicated response as follows (sales in million euro):

<2	2-5	6-10	11-25	26-50	51-100	101-500	>500
[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]

Percentage of the credit line that is used Respondents indicated response as follows:

<10%	11-30%	31-50%	51-70%	71-90%	>90%
[1]	[2]	[3]	[4]	[5]	[6]

Accounts receivable / Assets Respondents indicated response as follows:

<5%	5-10%	11-20%	21-30%	31-40%	>40%
[1]	[2]	[3]	[4]	[5]	[6]

Net income Respondents indicated response as follows (in million euro):

<0.5	0.5-1.0	1.1-5.0	5.1-10.0	>10.0
[1]	[2]	[3]	[4]	[5]

Funding requirements of current assets Respondents indicated response as follows (in million euro):

<0.5	0.5-1.0	1.1-3.0	3.1-10.0	10.1-20	>20
[1]	[2]	[3]	[4]	[5]	[6]

Equity / Assets Respondents indicated response as follows:

<10%	11-20%	21-30%	31-40%	41-50%	>50%
[1]	[2]	[3]	[4]	[5]	[6]

Seller's interest rates on current debt Respondents indicated response as follows:

<3%	3-6%	7-9%	9-13%	14-17%	>17%
[1]	[2]	[3]	[4]	[5]	[6]

Seasonality of the seller's sales	Respondents indicated response as follows:					
	Completely	Very heavily	Heavily	Not Heavily	Hardly	Not at all
	[1]	[2]	[3]	[4]	[5]	[6]

Industry

Respondents chose between one of the following industry sectors:
Automotive, Construction, Chemistry, Services, Energy & Commodities, Wholesale & Retail, Manufacturing, Consumer Goods, Media, Foods, Pharmaceuticals, Software, Technology, Telecommunications, Transportation & Logistics, Utilities, Temporary Work and Other.

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