Are SMEs locked in relationships with their banks?*

*Krzysztof Jackowicz, Łukasz Kozłowski***

Abstract

In this study, we investigate whether SMEs are locked in relationships with their banks. We combine data concerning Polish SMEs, including a survey about relationships with main banks. After estimating dynamic panel models, we find that the length of a bank-firm relationship increases firms' interest costs, slows down investments and sales growth but is irrelevant for firms' profitability. Therefore, our evidence supports the view that the collection of private data by a bank may "lock" a firm in the existing relationship with the bank, permit this lender to extract information monopoly rents, and force the SME to incur the so-called hold-up costs.

Keywords: SME, bank-firm relationship, hold-up problem, lock-in problem
JEL Codes: G21, G30

1. Introduction

Small and medium-sized enterprises (SMEs) constitute a vital part of each economy. As the European Commission in its Annual Report on European SMEs underscores, EU-28 SMEs made a significant contribution to the economic recovery after the global financial crisis between 2008 and 2017, and this contribution even "exceeded what would have been expected on the basis of their relative importance in the economy" (European Commission 2018). Namely, in 2018, slightly more than 25 million SMEs in the EU-28 generated not only 56.4 % of value added and but also accounted for 66.6 % of employment in the non-financial business sector (European Commission 2019:11). Consequently, studies on determinants of SMEs' success are extremely important from a perspective of policy making within the EU.

As literature suggests, limited access to external financing remains one of the main impediments for the growth of the SME sector (Ayyagari/Demirgüç-Kunt/Maksimovic 2017; Hasan/Jackowicz/Kowalewski/Kozłowski 2017; Moscalu/Girardone/Calabrese 2020). For this reason, this paper examines bank-firm relationships in the context of possible benefits and dangers a firm may encounter. Specifically, in our study, we discuss economic effects of SMEs' prolonged and strong relationships with their main banks. When assessing the impact of such relationships on SMSs, we consider two competing theories related to the role of information asymmetry between small firms and banks. The first theory con-

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jectures that benefits of SMEs stemming from strong relationships with banks increase in duration of those relationships because longer cooperation leads to diminished information asymmetry. In contrast, the second theory predicts that the situation of SMEs worsens as relationships with banks strengthens because such relationships augment information asymmetry between the current relationship lender and other potential lenders (Sharpe 1990; Rajan 1992; von Thadden 1995; Boot 2000; Ongena/Smith 2001). As those theories are mutually exclusive, we formally test a hypothesis linked to the later theory which assumes the existence of the so-called hold-up costs. To be specific, we presume that within a long-run and strong bank-firm relationship the lender is able to exploit private (unavailable to other lenders) information about the firm and, as a result, "lock" the firm in the existing relationship extracting at the same time information monopoly rents.

To verify our hypothesis, we combine data describing Polish SMEs from four sources, including a survey about bank-firm relationships concerning a sample of 698 firms. Estimation of dynamic panel models provides evidence consistent with the hypothesis. Namely, the research outcomes indicate that the length of a bank-firm relationship increases a firm's interest costs on long-term debt, slows down investments and sales growth, however, it is irrelevant for the firm's profitability. Interestingly, the duration of a bank-firm relationship seems to affect interest costs directly and other aspects of SME performance mostly indirectly through the investment channel. At the same time, our results confirm the view expressed in the literature that relationship lenders in general alleviate small firms' financial constraints in comparison to transactional lenders. Thus, our study contributes to the literature on bank-firm relationships as it shows that economic repercussions of relationship lending and a strong bank-firm cooperation are nuanced and may bring both benefits and costs for small firms.

The remainder of this paper consists of five parts. First, we review the existing empirical evidence on economic effects of strong bank-firm relationships. Second, we present our data sources and empirical strategy. Third, we discuss the estimation results. Fourth, we discuss robustness checks. The final section concludes.

2. Literature review

Literature strands upon which we build our study are linked to the impact of a bank-firm relationship on firm financial situation. As Prilmeier (2017) notes, banking relationships influence information asymmetry on two levels. First, as the relationships strengthen, the lender becomes better informed about borrower and the information asymmetry between a firm and a bank is reduced. Second, the information acquisition during the relationship increases the information

asymmetry between the bank involved in the relationship and other banks. Both phenomena have opposite repercussions for a firm involved in the relationship.

From the first perspective, strong bank-firm relationships are seen as valuable for a firm because they limit financial constraints (Shen/Wang 2005). This effect is especially important for SMEs which have several undesirable traits as potential borrowers. In comparison with large firms, smaller companies are usually more informationally opaque, produce financial statements of a relatively lower quality, and possess limited collateral (Berger/Udell 1998; Stein 2002; Udell 2008). Thus, soft information processing boosted through SMEs' durable and strong relationships with banks play a fundamental role for the banks' abilities and willingness to assess SMEs' financial standing and development prospects (Boot 2000; Bartoli/Ferri/Murro/Rotondi 2013). In other words, SMEs' prolonged and intensive cooperation with banks significantly reduces information asymmetry and alleviates their financial constraints. A special role within this context is played by small, local, decentralized banks with a flat organizational structure which apply a relationship-oriented lending model. These banks have a competitive advantage over large, transaction-oriented banks in soft information gathering and processing (Petersen/Rajan 1994; Berger/Udell 1995; Berger/Miller/Petersen/Rajan/Stein 2005). The improvement in SMEs' access to bank loans triggered by these firms' cooperation with relationship lenders has been documented in both developed and emerging economies (Berger/Klapper/Udell 2001; Berger/Klapper/Martinez Peria/Zaidi 2008; Berger/Bouwman/Kim 2017; Canales/Nanda 2012; Hasan et al. 2017; Iwanicz-Drozdowska/Jackowicz/Kozłowski 2018).

Nevertheless, acquisition of private information by banks over the course of a relationship may also have less advantageous consequences for SMEs. As the literature on the so-called hold-up or lock-in problem suggests, the information acquired by a bank within its relationship with a firm increases the information asymmetry between this bank and other potential lenders. As a result, collection of soft and "private" data makes the bank an information monopolist, and the bank can exploit its power by charging the firm higher interest rates on new loans or by threatening the firm not to extend additional loans. Consequently, the firm incurs the so-called hold-up costs resulting from an established relationship with only one bank (Sharpe 1990; Rajan 1992; von Thadden 1995; Ongena/Smith 2001). However, existing evidence related to the hold-up problem is not conclusive. The study by Hale and Santos (2009), analyzing spreads on bank loans after bond IPOs, supports the existence of the hold-up problem in bank-firm relationships. The authors show that IPOs – revealing new information about a firm – disrupt existing information monopoly of the firm's main bank, and – as a result – allow the firm to pay lower spreads on bank loans. Those interest rate savings are more substantial for firms that are identified to be safe during bond IPO period. Among safe firms, those that get their first rating

benefit from a larger decline in loan interest rates than already rated companies. Farinha and Santos (2002) also signal some problems that may be related to the hold-up problem. They establish that the likelihood of a firm substituting a single relationship with multiple relationships increases with the duration of that relationship and is greater for firms with more growth opportunities. In contrast, Ongena and Smith (2001) show for a sample of Norwegian firms that small, young, and highly leveraged firms maintain the shortest relationships which is inconsistent with the view that such firms are locked in bank relationships. Moreover, they find that long-term relationships are especially valuable for firms that are unlikely to face hold-up threats from informationally monopolistic banks.

Based on the evidence concerning the hold-up problem, we propose the following hypothesis:

Hypothesis: *The strengthening of a bank-firm relationship is detrimental to the involved firms.*

We expect that the extractions of information monopoly rents should be the most pronounced for the long-term and exclusive relationships. We also plan to verify whether the establishment of multiple bank relationships, as suggested by Yasuda (2007), mitigates the hold-up problem consequences.

3. Empirical strategy

In order to answer our research questions, we combined data from four sources. First, we utilized Bureau van Dijk's Amadeus database with Polish firms' financial statements for the 2006–2015 period. Within this population, following Eurostat's definition, we identified SMEs as firms having fewer than 250 persons employed and an annual turnover of up to EUR 50 million or a total balance sheet of no more than EUR 43 million. Having defined this population, we removed inactive firms, that is, SMEs without recorded financial statements for each year of the 2013–2015 period, financial firms (due to incomparability of their financial statements with statements of other firms), companies from service industries (they have relatively limited relationships with banks as they rarely finance their assets with a long-term debt), utilities (they are often publicly owned which may push them towards stable relationships with a state-owned bank), as well as firms which are located in markets without access to both relationship and transactional lenders[1] (their relationships with banks are mechanically and irrevocably adjusted to the specificity of relationships

1 After geo-locating all bank branches in Poland and firms' head offices, we calculated each firm's distance from individual bank branches. Next, we excluded firms that did not have access (within the 5 km radius) to both relationship lenders (small local banks) and transactional lenders (commercial banks with a nation-wide presence).

preferred by banks operating in their vicinity). We end up with a population of ca. 23.5 thousand companies.

Second, we constructed a survey questionnaire related to specificities of bank-firm relationships, including a year in which a relationship was established, type of a firm's main bank (a relationship or a transactional lender), and exclusiveness of the relationship. A professional firm specializing in computer-assisted telephone interviewing (CATI) contacted randomly drawn SMEs and asked their top managers (firm owners in majority of cases) the survey questions. Initially, the survey covered 701 companies, but finally 3 out of them were dropped from the sample due to missing data for some variables constructed with the use of the first dataset (based on the Amadeus data source).

Third, in order to reflect the investigated firms' local environments, we utilized county-level statistics provided by the Polish Central Statistical Office for each year within our sample period. This data source reflects demographic and economic situation for each of 380 Polish counties. However, it does not include information necessary to describe SMEs' local banking markets although they can directly affect the firms' relationships with banks. Therefore, we augment our sample with information from the fourth data source provided by an independent research company Inteliace Research. This dataset includes detailed addresses of all bank branches in Poland for our sample period.

We combined data coming from the described sources and constructed a panel sample with firm-year observations. Then, we employed this dataset to estimate dynamic panel models explaining firms' different financial indicators to check whether strong relationships with banks force SMEs to incur the so-called hold-up costs. The model parameters are estimated using the Generalized Method of Moments (GMM-SYS) procedure proposed by Blundell and Bond (1998). In contrast to other panel estimators, including the fixed- or random-effects models, this method allows us to remove the strict exogeneity assumption and–as a result–to include lagged dependent variables among regressors. Thus, in our research, we are able to efficiently control for the potential persistence over time in the values of the dependent variable, that is, to account for a situation in which our dependent variable is correlated with past shocks to it. While instrumentalizing our regression models, we treat the lagged dependent variable as only sequentially exogenous. Other regressors are treated as strictly exogenous. The appropriateness of the set of instruments is formally evaluated by the Arellano–Bond test for the error autocorrelation (Arellano/Bond 1991) and the Hansen test of over-identifying restrictions (Hansen 1982). Within the former test, we anticipate the presence of significant negative first-order serial correlation, AR(1), and the lack of significant second-order serial correlation in the differenced residuals, AR(2). Further, while performing the Hansen test, we

anticipate no grounds for the rejection of the null hypothesis that the instruments are valid.

Eq. (1) illustrates the general construction of our dynamic panel models:

$$\begin{aligned} DEP_{i,t} = {} & \alpha_0 + \alpha_1 \bullet DEP_{i,t-1} + \alpha_2 \times \mathbf{FIRM.CTRL}_{i,t-1} + \alpha_3 \times \mathbf{LOCAL}_{i,t} + \alpha_4 \\ & \times \mathbf{BANK.MARKET}_{i,t} + \alpha_5 \times \mathbf{RELATIONSHIP}_{i,t} + \alpha_6 \times \mathbf{YEAR.DUMMIES}_t + \alpha_7 \\ & \times \mathbf{INDUSTRY.DUMMIES}_i + \varepsilon_{i,t} \end{aligned} \quad (1)$$

where scalars α_0, α_1 and vectors **α2**, **α3,** …, **α7** refer to regression coefficients; $DEP_{i,t}$ denotes the value of our dependent variable for the i-th firm in year t, and specifically it represents the firm's interest costs on bank and long-term debt (a variable INT.COST)[2], investment outlays (INVEST), growth rate of sales (SALES.GR) or profitability measured with the EBIT to sales ratio (PROFIT). The first set of control variables (the vector $\mathbf{FIRM.CTRL}_{i,t-1}$) reflects lagged firm-level characteristics, including its size measured with the natural logarithm of sales (FIRM.SIZE), firm age (FIRM.AGE), fixed assets to total assets ratio (TANGIBILITY), cash resources in relation to total assets (CASH), equity to total assets ratio (EQUITY), ratio of long-term debt to total liabilities (LT.DEBT), asset turnover calculated as the ratio of sales to total assets (TAT), and ebit to sales ratio (the variable PROFITS in INT.COST and SALES.GR regressions). Second, we control for the i-th firm's local environment in year t (the vector $\mathbf{LOCAL}_{i,t}$), that is, unemployment rate (UNEMPL) and population density (POPUL.DENS) in a firm's county. Third, we account for the i-th firm's local banking market (the vector $\mathbf{BANK.MARKET}_{i,t}$), that is, bank branch density (BANK.BRANCH.DENS) and access to branches of small local relationship lenders (LOC.BANKS.ACCESS). Fourth, survey-based group of variables (the vector $\mathbf{RELATIONSHIP}_{i,t}$) represents the i-th firm's relationship with its main bank in year t, including the length of the relationship (REL.LENGTH), specificity of the firm's main bank (LOC.BANK), and the relationship's exclusiveness (ONE.BANK). Year and industry dummies (the vectors $\mathbf{YEAR.DUMMIES}_t$ and $\mathbf{INDUSTRY.DUMMIES}_i$) supplement the set of our regressors. Finally, $\varepsilon_{i,t}$ denotes the error term.

Table 1 presents detailed definitions of all variables employed in our study, Table 2 provides respective descriptive statistics while Table 3 characterizes the

2 In our study, we use the implied interest costs because we have no data on actual interest rates charged on loans. However, this limitation of our data set should not materially distort our results since loans with fixed interest rates were extremely rare during the sample period. Since the early 1990 till the end of the sample period, the Polish economy witnessed a gradual disinflation process. For this reason, firms were reluctant to contract loans with fixed interest payments. Only recently banks started to offer on a wider scale loans (mortgages, above all) with fixed interest rates. Moreover, the results remain unchanged when we base the dependent variable on financial costs instead of interest costs in order to reflect different bank pricing policies.

structure of our data. Table 2 shows that the average length of a bank-firm relationship in our sample equals 10 years, but in one fourth of cases it is no longer than 4 years. Further, 17 % of companies cooperate with small relationship lenders, and in 43 % of cases the existing relationship is exclusive, that is, a firm is involved in a cooperation with only one bank. Table 3 documents that both the number of firms and counties covered by our sample increased over time. In 2007, observations concerned 184 firms from 109 counties. Eight years later observations regarded 689 firms from 253 counties. Before employing our variables in the regression models, we also verified their correlations in order to avoid potential biases due to multicollinearity problems. The highest absolute value of the correlation coefficient equals 0.723 and concerns two county-level variables (POPUL.DENS and LOC.BANKS.ACCESS). Apart from that, the absolute value of the correlation coefficient exceeds 0.4 in three cases, and for firm-level variables it surpasses 0.3 in three cases only. As a result, we believe that our set of regressors do not suffer from multicollinearity[3].

Table 1. Variable definitions

Variable	Definition
INT.COST	Ratio of interest costs to bank and long-term debt
INVEST	Yearly growth of fixed assets to total assets at the beginning of a year
SALES.GR	Growth rate of sales
PROFIT	EBIT to sales ratio
FIRM.SIZE	Natural logarithm of sales
FIRM.AGE	Number of years since a firm's foundation or since Poland's economic transition in 1990 (the shorter period is taken into account).
TANGIBILITY	Ratio of fixed assets to total assets
CASH	Ratio of cash and cash equivalent to total assets
EQUITY	Equity to assets ratio
LT.DEBT	Ratio of long-term debt to total liabilities
TAT	Ratio of sales to total assets
UNEMPL	Ratio of unemployment rate in a firm's county to the country's average
POPUL.DENS	Population density in a firm's county (in thousands/km^2)
BANK.BRANCH.DENS	Ratio of a number of bank branches in a firm's county to the county's population in thousands
LOC.BANKS.ACCESS	Share of cooperative bank branches (with a relational business model) in a firm's county
REL.LENGTH	The number of years since the beginning of a firm's relationship with its main bank
LOC.BANK	Variable that takes the value of 1 if a firm's main bank is a local cooperative bank, and 0 otherwise
ONE.BANK	Variable that takes the value of 1 if a firm has a relationship with only 1 bank, and 0 otherwise

3 The respective correlation matrix is available upon request from the authors.

Table 2. Descriptive statistics

Variable	Observations	Mean	Std.Dev.	Min	1st Quartile	Median	3rd Quartile	Max
INT.COST	2,651	0.102	0.093	0.000	0.050	0.077	0.117	0.695
INVEST	4,790	0.019	0.119	-0.704	-0.024	-0.004	0.025	1.161
SALES.GR	4,774	0.043	0.315	-0.965	-0.100	0.003	0.134	2.800
PROFIT	4,803	0.061	0.126	-1.787	0.011	0.040	0.094	0.969
FIRM.SIZE	4,803	11.163	1.286	5.375	10.300	11.196	12.049	15.124
FIRM.AGE	4,803	15.165	6.147	1.000	10.000	16.000	20.000	25.000
TANGIBILITY	4,803	0.337	0.251	0.000	0.114	0.306	0.526	0.990
CASH	4,784	0.145	0.173	0.000	0.020	0.073	0.211	1.000
EQUITY	4,783	0.564	0.244	0.000	0.374	0.576	0.765	1.000
LT.DEBT	4,781	0.144	0.219	0.000	0.000	0.024	0.212	0.995
TAT	4,779	2.214	1.511	0.027	1.176	1.861	2.902	9.993
UNEMPL	4,803	0.975	0.509	0.179	0.560	0.920	1.299	3.284
POPUL.DENS	4,803	0.924	1.083	0.027	0.074	0.185	1.831	3.420
BANK.BRANCH.DENS	4,803	0.414	0.118	0.125	0.334	0.410	0.482	0.893
LOC.BANKS.ACCESS	4,803	0.277	0.206	0.000	0.078	0.258	0.423	0.966
REL.LENGTH	3,110	9.910	6.578	0.000	4.000	9.000	15.000	23.000
LOC.BANK	4,605	0.166	0.372	0.000	0.000	0.000	0.000	1.000
ONE.BANK	4,755	0.425	0.494	0.000	0.000	0.000	1.000	1.000

Table 3. Distribution of observations by year

Year/period	Firms	Counties covered
2007	184	109
2008	434	202
2009	505	218
2010	544	225
2011	557	229
2012	573	234
2013	642	246
2014	687	255
2015	689	253
2007–2015	698	255

4. Results

We start our investigations by checking whether a firm's interest costs on its long-term debt increase as a result of strengthening of a relationship with the firm's main bank. The estimation outcomes in Table 4 corroborate our theoretical suppositions. In specification 2, the estimated coefficient for the REL.LENGTH variable is positive and statistically significant. Its value addi-

tionally shows that the outcome is relevant also in economic terms. To be more precise, 10 years of a bank-firm relationship are associated with an increase of the firm's interest costs by almost 1 percentage point in relation to a firm which has just initiated its cooperation with a bank. This value constitutes 13.7 % of the INT.COST variable's interquartile range in our sample. However, the results in specification (3) add an interesting observation to our initial findings. In this specification, we supplement the set of regressors with a binary variable coding firms which cooperate with relationship lenders (LOC.BANK) as well as an interaction term of this additional regressor and the REL.LENGTH variable. The estimation results indicate that the hold-up costs are incurred only by SMEs involved in a cooperation with small local banks applying the relationship lending model. Such banks have a competitive advantage over large, supra-local banks in soft information processing, and are better positioned to "lock" a firm in a relationship. The coefficient for the interaction term REL.LENGTH x LOC.BANK is statistically significant at the 5 % level and its value suggests that a company with a 10-year history of a cooperation with a small bank incurs interest costs higher by 1.9 percentage points in relation to a firm which has just started a relationship with this lender. Interestingly, although we find evidence that small local banks extract monopoly rents from long-term relationships with SMEs, at the same time the estimation outcomes show that such banks initially alleviate SMEs financial constraints in comparison to transactional-lenders. The coefficient for the LOC.BANK variable is negative and statistically significant, which suggests that on average small local banks offer lower interest rates on loans to SMEs than large, supra-local banks do. Nevertheless, these benefits disappear over time, that is, once the bank-firm relationship matures. In sum, the estimation outcomes support both suppositions expressed in the literature, that is, related to small local bank's ability to alleviate SMEs' financial constraints as well as to the existence of the hold-up phenomenon in case of long-term bank-firm relationships. Nevertheless, we do not find evidence supporting the view that the hold-up problem is linked to exclusiveness of a bank-firm relationship (specification 4).

With regard to estimation results for control variables, four firm-level regressors have consistently statistically significant coefficients. First, the positive and statistically significant coefficient for the lagged dependent variable suggests persistency in interests costs incurred by SMEs. Second, we find that more profitable and larger (presumably less opaque) SMEs can expect lower interest rates on long-term debt. For the sake of brevity, we do not show and discuss estimation outcomes for the control variables in the case of remaining specifications tabulated in this section.

Table 4. Impact of relationship length on a firm's interest costs (INT.COST)

This table presents the results of the GMM-SYS estimations. Robust standard errors are shown in parentheses. *, **, *** refer to significance at the 10 %, 5 %, and 1 % levels, respectively. We test for the validity of the instruments with the Arellano-Bond tests for first- and second-order serial correlation in the first-differenced residuals (Arellano and Bond, 1991) and the Hansen test (Hansen, 1982). For the sake of brevity, coefficients for constant terms, year and industry dummies are not reported.

Variables	(1)	(2)	(3)	(4)
$INT.COST_{t-1}$	0.130***	0.135**	0.133**	0.137**
	(0.0417)	(0.0533)	(0.0550)	(0.0546)
$FIRM.SIZE_{t-1}$	-0.00987***	-0.00964***	-0.0100***	-0.00915***
	(0.00191)	(0.00251)	(0.00258)	(0.00259)
$FIRM.AGE_{t-1}$	-3.43e-05	-0.000141	-0.000169	-0.000141
	(0.000393)	(0.000531)	(0.000537)	(0.000532)
$TANGIBILITY_{t-1}$	-0.0203	-0.0198	-0.0173	-0.0201
	(0.0147)	(0.0191)	(0.0192)	(0.0191)
$CASH_{t-1}$	-0.0111	-0.0132	-0.0143	-0.0175
	(0.0230)	(0.0287)	(0.0292)	(0.0298)
$EQUITY_{t-1}$	-0.000566	-0.00335	-0.00411	-0.00404
	(0.00982)	(0.0127)	(0.0128)	(0.0130)
$LT.DEBT_{t-1}$	-0.0208	-0.0143	-0.0154	-0.0136
	(0.0152)	(0.0224)	(0.0228)	(0.0226)
TAT_{t-1}	0.00504***	0.00629***	0.00668***	0.00620***
	(0.00183)	(0.00228)	(0.00228)	(0.00225)
$PROFITS_{t-1}$	-0.0667***	-0.0749**	-0.0747**	-0.0743**
	(0.0212)	(0.0326)	(0.0325)	(0.0328)
$UNEMPL_t$	-0.00543	-0.00441	-0.00503	-0.00613
	(0.00594)	(0.00813)	(0.00822)	(0.00825)
$POPUL.DENS_t$	-0.00361	-0.00139	-0.00234	-0.00164
	(0.00366)	(0.00504)	(0.00511)	(0.00509)
$BANK.BRANCH.DENS_t$	0.0363	0.0410	0.0439	0.0366
	(0.0262)	(0.0300)	(0.0300)	(0.0298)
$LOC.BANKS.ACCESS_t$	-0.0126	-0.0148	-0.0145	-0.0161
	(0.0159)	(0.0211)	(0.0218)	(0.0214)
$REL.LENGTH_t$		0.000917*	0.000613	0.00106*
		(0.000474)	(0.000515)	(0.000561)
$LOC.BANK_t$			-0.0249**	
			(0.0110)	
$REL.LENGTH_t$ x $LOC.BANK_t$			0.00191**	
			(0.000837)	
$ONE.BANK_t$				0.00802

Variables	(1)	(2)	(3)	(4)
				(0.00970)
$REL.LENGTH_t$ x $ONE.BANK_t$				-0.000131
				(0.000765)
Observations	2,416	1,504	1,468	1,487
Firms	453	325	318	323
AR(1)	-5.190***	-3.572***	-3.555***	-3.571***
AR(2)	-1.572	-1.522	-1.526	-1.528
Hansen	51.11	45.19	44.83	44.82
Number of instruments	69	70	72	72

The traits of a bank-firm relationship may affect not only interest rates but also other aspects of SMEs' performance. From a theoretical point of view, three transmission channels exist. The first channel assumes that the traits of bank-firm relationships impact interest costs directly and indirectly affect investments which in turn shape firms' growth and profitability. The second transmission channel is linked to firms' attitude toward risk. Höwer (2016) and Iwanicz-Drozdowska et al. (2018) show that relationship banks efficiently help their troubled customers from the SME sector. Cororaton (2020) adds that relationship banks organized as cooperatives, prioritizing the smooth provision of financial services over profitability, are more willing than other banks to maintain lending during economic downturns. Therefore, SME managers may exhibit higher appetite for risk when their firms remain in durable and strong relationships with banks. The third transmission channel is related to the distorted managers' incentives. As Peek and Rosengren (2005) and Höwer (2016) argue, SME managers aware of banks' willingness to keep borrowing firms alive regardless of their financial conditions (in order to avoid or delay recognition of credit losses) may lack strong incentive to prevent bad economic outcomes in the first place.

We conjecture that the first channel (through investments) should play the most important role in shaping other aspects of SMEs' performance. However, we cannot exclude that the second and third channels (through attitude toward risk and distorted managers' incentives, respectively) may also be relevant. For this reason, in Table 5 we test for the indirect impact of bank relationships (through investments) on SMEs' sales growth and profitability while in Table 6 we regress SME outcomes directly on traits of bank-firm relationships.

All of the three model specifications in Table 5 support the existence of the first transmission channel through SME investments. As we recall, specification (2) in Table 4 showed that interest costs increased in duration of a bank-firm relationship. Specification (1) in Table 5 suggests that these augmented interest costs translate into lower investment. The coefficient estimated for the lagged variable INT.COST is negative and statistically significant at the 1 % level.

Further, as stipulated by the first transmission channel, lowered investments reduce sales growth (specification 2), and diminished sales dynamics affects negatively profitability (specification 3). The identified empirical patterns are not only statistically significant but they are also relevant in economic terms. For example, an increase in interest costs by 6.7 p.p., that is, by the INT.COST variable's interquartile range, is expected to reduce investments by 1.3 p.p., that is, by 26.6 % of the INVEST variable's interquartile range.

Table 5. Transmission channel: from changes in interest costs to adjustments in profitability measures

This table presents the results of the GMM-SYS estimations. Robust standard errors are shown in parentheses. *, **, *** refer to significance at the 10 %, 5 %, and 1 % levels, respectively. We test for the validity of the instruments with the Arellano-Bond tests for first- and second-order serial correlation in the first-differenced residuals (Arellano and Bond, 1991) and the Hansen test (Hansen, 1982). For the sake of brevity, coefficients for control variables (the lagged dependent variable, FIRM.SIZE, FIRM.AGE, TANGIBILITY, CASH, EQUITY, LT.DEBT, TAT, and PROFITS in Panels A and B, as well as unlagged UNEMPL, POPUL.DENS, BANK.BRANCH.DENS, and LOC.BANKS.ACCESS), constant terms, year and industry dummies are not reported. In specification 2, we regress SALES.GR against the second lag of INVEST, as investments usually need more time to be finished and to generate higher sales.

Variables	(1) INVEST	(2) SALES.GR	(3) PROFIT
$INT.COST_{t-1}$	-0.195***		
	(0.0607)		
$INVEST_{t-2}$		0.115**	
		(0.0541)	
$SALES.GR_{t-1}$			0.0205**
			(0.0101)
Observations	2,276	3,440	4,095
Firms	465	668	693
AR(1)	-5.338***	-8.439***	-4.665***
AR(2)	-0.159	-0.613	-0.277
Hansen	70.78	12.76	80.39
Number of instruments	101	37	101

The direct influence of bank-firm relationships on interest costs and the indirect influence through investments on sales and profitability documented in Table 5 do not preclude the possibility that traits of a bank relationship affect SME outcomes more directly through risk appetite (the second transmission channel) and distorted managers' incentives (the third transmission channel). Consequently, in Table 6, we relate SME outcomes directly to traits of bank-firm relationships. As previously, we look at the hold-up problem from the perspective of a firm's investments (Panel A), growth (Panel B), and profitability (Panel C). Estimation

outcomes seem to be less nuanced than in case of our INT.COST regressions. First, in specifications (1) and (4), we notice that long-term bank-firm relationships are associated with SMEs' reduced investments, and finally lower sales growth. The respective coefficients are statistically significant at the 1 % level. The estimation outcomes are also relevant in economic terms, that is, a 10-year relationship with a bank is linked to reduction in investments and sales growth respectively by 1.3 and 3.9 percentage points. These values are equivalent to 25.7 % and 16.6 % of the respective variables' interquartile ranges in the sample. Although we do not find evidence that a relationship with a small local lender matters for the hold-up phenomenon (specifications 2 and 5), we observe that additional hold-up costs are incurred by SMEs involved in a relationship with only one bank. Namely, specification (6) shows that the length of a bank-firm cooperation unconditionally deteriorates a firm's sales growth, but this reduction is more severe in case of exclusive bank-firm relationships. Finally, tabulated results in Panel C do not provide evidence that the observed lock-in phenomenon has any impact on a firm's profitability. Although all coefficients for the REL.LENGTH variable are negative, neither of them is statistically significant.

Table 6. Impact of relationship length on a firm's investments (INVEST), sales growth (SALES.GR) and profitability (PROFIT)

This table presents the results of the GMM-SYS estimations. Robust standard errors are shown in parentheses. *, **, *** refer to significance at the 10 %, 5 %, and 1 % levels, respectively. We test for the validity of the instruments with the Arellano-Bond tests for first- and second-order serial correlation in the first-differenced residuals (Arellano and Bond, 1991) and the Hansen test (Hansen, 1982). For the sake of brevity, coefficients for control variables (the lagged dependent variable, FIRM.SIZE, FIRM.AGE, TANGIBILITY, CASH, EQUITY, LT.DEBT, TAT, and PROFITS in Panels A and B, as well as unlagged UNEMPL, POPUL.DENS, BANK.BRANCH.DENS, and LOC.BANKS.ACCESS), constant terms, year and industry dummies are not reported.

Panel A. Impact on investments (INVEST)

Variables	(1)	(2)	(3)
$REL.LENGTH_t$	-0.00125***	-0.00117***	-0.000833*
	(0.000382)	(0.000422)	(0.000488)
$LOC.BANK_t$		0.00251	
		(0.0126)	
$REL.LENGTH_t$ x $LOC.BANK_t$		-0.000616	
		(0.000803)	
$ONE.BANK_t$			0.00316
			(0.00990)
$REL.LENGTH_t$ x $ONE.BANK_t$			-0.00107
			(0.000691)

Variables	(1)	(2)	(3)
Observations	2,734	2,651	2,719
Firms	526	512	524
AR(1)	-5.964***	-5.772***	-5.892***
AR(2)	-0.00844	0.117	0.248
Hansen	30.66	34.26	37.32
Number of instruments	59	61	61

Panel B. Impact on sales growth (SALES.GR)

Variables	(4)	(5)	(6)
$REL.LENGTH_t$	-0.00390***	-0.00399***	-0.00245*
	(0.00113)	(0.00126)	(0.00144)
$LOC.BANK_t$		-0.0615*	
		(0.0347)	
$REL.LENGTH_t$ x $LOC.BANK_t$		0.000646	
		(0.00216)	
$ONE.BANK_t$			0.0142
			(0.0286)
$REL.LENGTH_t$ x $ONE.BANK_t$			-0.00350*
			(0.00205)
Observations	2,719	2,634	2,704
Firms	522	508	520
AR(1)	-7.248***	-7.211***	-7.252***
AR(2)	0.0356	0.129	0.0352
Hansen	5.897	4.562	5.912
Number of instruments	32	34	34

Panel C. Impact on profitability (PROFIT)

Variables:	(7)	(8)	(9)
$REL.LENGTH_t$	-0.000319	-0.000412	-0.000348
	(0.000446)	(0.000516)	(0.000641)
$LOC.BANK_t$		-0.00865	
		(0.0139)	
$REL.LENGTH_t$ x $LOC.BANK_t$		0.000510	
		(0.00107)	
$ONE.BANK_t$			0.00262
			(0.00873)
$REL.LENGTH_t$ x $ONE.BANK_t$			2.92e-05
			(0.000833)
Observations	3,110	3,014	3,093

Variables:	(7)	(8)	(9)
Firms	527	513	525
AR(1)	-3.762***	-3.697***	-3.772***
AR(2)	-1.300	-1.341	-1.301
Hansen	32.25	32.99	32.54
Number of instruments	69	71	71

5. Robustness checks

In the previous section, we established that situation of bank customers worsens with the length of a bank-firm relationship. To check the stability of this crucial finding, we performed three robustness checks. They encompassed changes in model construction as well as verification whether our results are distorted by the selection bias.

First, if we assume that relationship banks start to take advantage of their informational monopoly and extract rents from firms with a delay, firms that have just changed their banks should exhibit superior performance in comparison to other firms. To test this predicition, we introduced into our regressions a binary variable NEW.CLIENT which takes the value of one for the firm-year observations directly following the bank change, and zero otherwise. Table 7 presents the appropriate results. It turns out that firms–new bank customers–enjoy lower interest costs, report quicker sales growth and achieve higher profitablity. The identified empirical pattern confirms that relationship banks need time to exploit their informational monopoly and impose hold-up costs. Consequently, it corroborates also our main finding concerning the existence of the hold-up problem.

Table 7. Situation of firms that have just changed their banks

This table presents the results of the GMM-SYS estimations. Robust standard errors are shown in parentheses. *, **, *** refer to significance at the 10 %, 5 %, and 1 % levels, respectively. We test for the validity of the instruments with the Arellano-Bond tests for first- and second-order serial correlation in the first-differenced residuals (Arellano and Bond, 1991) and the Hansen test (Hansen, 1982). For the sake of brevity, coefficients for control variables (the lagged dependent variable, FIRM.SIZE, FIRM.AGE, TANGIBILITY, CASH, EQUITY, LT.DEBT, TAT, and PROFITS in Specifications 1, 2 and 4, as well as unlagged UNEMPL, POPUL.DENS, BANK.BRANCH.DENS, and LOC.BANKS.ACCESS), constant terms, year and industry dummies are not reported.

Variables	(1) INT.COST	(2) INVEST	(3) SALES.GR	(4) PROFIT
$NEW.CLIENT_t$	-0.0151***	0.0116	0.0464**	0.0148**
	(0.00546)	(0.00872)	(0.0232)	(0.00645)
Observations	1,504	2,734	2,719	3,110
Firms	325	526	522	527
AR(1)	-3.578***	-5.979***	-7.238***	-3.743***
AR(2)	-1.511	-0.00982	0.0286	-1.311
Hansen	46.78	30.85	6.016	30.67
Number of instruments	70	59	32	69

Second, interest rates set on loans usually reflect borrowers' credit risk. Despite the fact that the literature identifies some exceptions to this rule and shows that, for example, relationship banks intertemporally smooth their lending income (Hoshi/Kashyap/Scharfstein 1990; Berlin/Mester 1999; Boot 2000; Shimizu 2012), in the previous section we used several indirect measures of credit risk (the variables EQUITY, PROFIT, TAT and CASH). However, to check whether these indirect measures sufficiently capture firms' credit risk, we re-estimated regressions from Table 4 after adding a more direct credit risk measure. Namely, we calculated the so-called z-scores (defined as: $(ROA+(Equity/Asset))/\sigma(ROA)$, where σ stands for standard deviation) for the sample firms. Z-scores illustrate the probability of default based on the accounting data because they show how many standard deviations of profitability are needed to deplete total equity (Hryckiewcz 2014). To avoid excessive correlations, we removed the variables PROFIT and EQUITY from our models. Table 8 presents the respective results. As we can see, the new variable Z.SCORE enters the regression with the expected, negative sign and remains statistically significant in three out of four specifications. Therefore, firms with lower default risk enjoy lower interest rates. Importantly, the research outcomes concerning the existence of the hold-up problem do not change when we directly control for the borrowers' credit risk.

Table 8. Impact of relationship length on a firm's interest costs (INT.COST) after introduction of a direct credit risk measure

This table presents the results of the GMM-SYS estimations. Robust standard errors are shown in parentheses. *, **, *** refer to significance at the 10 %, 5 %, and 1 % levels, respectively. We test for the validity of the instruments with the Arellano-Bond tests for first- and second-order serial correlation in the first-differenced residuals (Arellano and Bond, 1991) and the Hansen test (Hansen, 1982). For the sake of brevity, coefficients for control variables (the lagged dependent variable, FIRM.SIZE, FIRM.AGE, TANGIBILITY, CASH, LT.DEBT, TAT, and unlagged UNEMPL, POPUL.DENS, BANK.BRANCH.DENS, and LOC.BANKS.ACCESS), constant terms, year and industry dummies are not reported.

Variables	(1)	(2)	(3)	(4)
$Z.SCORE_{t-1}$	-0.000137	-0.000490**	-0.000489**	-0.000470**
	(0.000162)	(0.000233)	(0.000235)	(0.000232)
$REL.LENGTH_t$		0.000985**	0.000657	0.00120**
		(0.000476)	(0.000512)	(0.000566)
$LOC.BANK_t$			-0.0261**	
			(0.0113)	
$REL.LENGTH_t$ x $LOC.BANK_t$			0.00202**	
			(0.000852)	
$ONE.BANK_t$				0.00909
				(0.00968)
$REL.LENGTH_t$ x $ONE.BANK_t$				-0.000379
				(0.000769)
Observations	2,418	1,504	1,468	1,487
Firms	453	325	318	323
AR(1)	-5.245**	-3.640***	-3.614***	-3.630***
AR(2)	-1.544	-1.526	-1.533	-1.535
Hansen	50.85	43.82	44.20	43.78
Number of instruments	68	69	71	71

Third, our study on the severity of hold-up problems relies partially on survey data. Therefore, it is important to check whether our results are not distorted by a selection bias. Theoretically, firms with different vulnerabities to beeing locked-in in the existing relationship may have also different incentive to provide answers to survey questions. To verify the presence of the selection bias in our sample, we compared two subsamples from our study: (a) the subsample of 528 firms that answered our survey questions about the length of their relationship with their main bank (i.e., responsive firms), and (b) the remaining 173 firms that participated in the survey but refused to provide us with this information (i.e., non-responsive firms). We focused on financial ratios reflecting a firm's proneness to the hold-up problem. For this reason, we examined whether the firms in those subsamples differ in their size, age and profitability. It turned out that in all analyzed cases the responsive firms did not differ statistically significantly from the non-responsive firms[4]. In particular, the responsive firms were not younger, smaller and less profitable than other surveyed firms. Consequently, the results of this check indicate that firm characteritics usally linked to the vulnerability of beeing locked-in do not shape firms' wilingness to answer survery questions and suggest that our counclusions are not materially distorted by the selection bias.

4 The detailed results of this check are available upon request from the authors.

6. Conclusions

We investigated the hold-up problem among Polish SMEs. After combining four data sources, including a survey data on 698 SMEs, and estimating dynamic panel regression models, we found evidence supporting the view that the collection of private data by a bank may "lock" a firm in a relationship with this bank. As a result of a long-run bank-firm relationship, the lender extracts monopoly rents and impose the so-called hold-up costs on the SME. Namely, we observed that firms involved in a prolonged relationship with a bank are more likely to pay more for their long-term debt and, consequently, invest less, and report reduced sales growth rates in comparison to companies which have just started their cooperation with a bank. However, we do not find evidence that the hold-up costs finally manifest in a firm's reduced profitability. Although our results show that a long-run relationship with a bank may work to the detriment of a small firm, at the same time the estimation outcomes support the view that relationship lenders are able to alleviate SMEs' financial constraints in comparison to transaction-oriented lenders. Namely, SMEs initially pay less for a debt incurred at small local banks but, once the relationship matures, the bank is able to exploit the cooperation to a firm's detriment and impose less favorable lending conditions.

In our opinion, the results have managerial implications for SME owners. Namely, they indicate that economic effects of SMEs' relationships with small local banks are more nuanced than initial experience might suggest. First, although relationship lenders are difficult to replace in soft information processing and able to offer advantageous loan conditions in comparison to transactional lenders, SME managers should not unconditionally resign from cooperation with different bank types. Second, as the length of a relationship with a bank may increase costs for a firm, bank selection should not be treated as a single or sporadic decision in a firm's history but an ongoing process giving a firm possibilities to choose between different lenders.

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