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**Working Paper**

## Credit access and borrowing costs in Poland's agricultural credit market: a hedonic pricing approach

Discussion Paper, No. 46

**Provided in Cooperation with:**

Leibniz Institute of Agricultural Development in Transition Economies (IAMO), Halle (Saale)

*Suggested Citation:* Petrick, Martin; Latruffe, Laure (2003) : Credit access and borrowing costs in Poland's agricultural credit market: a hedonic pricing approach, Discussion Paper, No. 46, Institute of Agricultural Development in Central and Eastern Europe (IAMO), Halle (Saale), <http://nbn-resolving.de/urn:nbn:de:gbv:3:2-23217>

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# **DISCUSSION PAPER**

**Institute of Agricultural Development in  
Central and Eastern Europe**

**CREDIT ACCESS AND BORROWING COSTS IN  
POLAND'S AGRICULTURAL CREDIT MARKET:  
A HEDONIC PRICING APPROACH**

**MARTIN PETRICK AND LAURE LATRUFFE**

**DISCUSSION PAPER No. 46  
2003**

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ISSN 1438-2172

**ABSTRACT**

The paper empirically investigates credit access and borrowing costs in Poland's rural financial market. We conduct an econometric analysis based on cross-sectional survey data including formal loans taken in the period 1997-1999. A hedonic regression of the effective interest rate, comprising both the nominal interest rate and additional transaction costs faced by farmers, allows the identification of the determinants of borrowing costs. These determinants can be interpreted as loan attributes and their implicit prices calculated. We proceed in two steps. In the first step, farmers' credit access is estimated by a Probit model. The second step is the hedonic regression, in which the Probit results are taken to test for selectivity.

The results support the widely held view that formal lenders tend to discriminate against smaller farms. They also suggest that the presence of devices to screen and signal the quality of borrowers makes borrowing more likely and reduces borrowing costs. Furthermore, the analysis reveals that the choice of the type of bank has a significant effect on borrowing costs. All other loan attributes equal, the traditional institutions for agricultural lending (the cooperative banks and the governmentally controlled Bank for Food Economy) offer between 1.1 and 1.3 percentage point higher effective interest rates as compared with the most favourable terms available, which has implications for a potential future restructuring of the Polish rural banking sector. In addition, there is strong evidence that the government subsidisation of nominal interest rates is severely counteracted by increased transaction costs and an adverse selection of borrowers. However, there is still a net reduction of the effective interest rate by 1.4 percentage point on average, compared to non-subsidised loans. This raises the question whether lending procedures under the government programme are sufficiently streamlined and whether loans are effectively targeted.

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JEL: Q 12, Q 14, P 32.

Keywords: agricultural finance, credit policy, transaction costs, Poland, microeconometrics.

**ZUSAMMENFASSUNG**

Gegenstand dieses Beitrags ist die empirische Untersuchung von Kreditzugang und Kreditkosten auf Polens ländlichen Finanzmärkten. Zu diesem Zweck wird eine ökonometrische Analyse von Querschnittsdaten durchgeführt, die Informationen zu formellen Kreditkontrakten für die Zeitperiode 1997-1999 beinhaltet. Mit Hilfe einer hedonischen Regression des effektiven Zinssatzes, der sowohl den nominalen Zinssatz als auch zusätzliche Transaktionskosten umfasst, werden die Determinanten der Kreditkosten analysiert. Diese Determinanten können als Krediteigenschaften interpretiert werden, was eine Berechnung ihrer impliziten Preise ermöglicht. Unser Vorgehen besteht aus zwei Schritten. Im ersten Schritt wird der Zugang zu Krediten durch ein Probit-Modell geschätzt. Der zweite Schritt beinhaltet die hedonische Regression, wobei die Probit-Ergebnisse für einen Selektivitäts-Test verwendet werden.

Die Ergebnisse bestätigen die verbreitete Ansicht, dass formelle Kreditgeber kleinere landwirtschaftliche Betriebe tendenziell benachteiligen. Die Ergebnisse legen außerdem nahe, dass Verfahren zur Aufdeckung und Signalisierung der Nachfragerqualitäten die Kreditaufnahme wahrscheinlicher machen und die Kreditkosten senken. Die Analyse verdeutlicht, dass die Wahl der Bank einen signifikanten Effekt auf die Höhe der Kreditkosten hat. Bei sonst gleichen Vertragseigenschaften bieten die traditionellen landwirtschaftlichen Kreditgeber (die

Genossenschaftsbanken und die von der Regierung kontrollierte Bank für Nahrungsmittelwirtschaft) um 1,1 bzw. 1,3 Prozentpunkte höhere effektive Zinssätze, verglichen mit dem günstigsten Angebot. Dies ist für eine künftige Restrukturierung des ländlichen Bankensektors in Polen von Bedeutung. Außerdem gibt es deutliche Hinweise darauf, dass die Wirkung der staatlichen Zinssubventionierung durch gesteigerte Transaktionskosten und adverse Selektion von Kreditnehmern stark verringert wird. Allerdings führt sie im Vergleich zu nichtsubventionierten Krediten immer noch zu einer Netto-Verringerung des effektiven Zinssatzes um durchschnittlich 1,4 Prozentpunkte. Es stellt sich daher die Frage, ob die VergabeprozEDUREN des staatlichen Kreditprogramms hinreichend effizient sind und ob die Kredite effektiv plaziert werden.

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JEL: Q 12, Q 14, P 32.

Schlüsselwörter: Agrarfinanzierung, Kreditpolitik, Transaktionskosten, Polen, Mikroökonomie.

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**LIST OF IMPORTANT ABBREVIATIONS AND SYMBOLS**

<i>A</i>	periodical payments
<i>b</i>	dichotomous variable indicating borrowers (yes/no)
<i>BC</i>	borrowing costs
<i>BGŻ</i>	Bank for Food Economy (Bank Gospodarki Żywnościowej)
<i>L</i>	loan volume
<i>PKO</i>	savings bank PKO BP (Powszechna Kasa Oszczędności Bank Polski)
<i>r</i>	nominal interest rate
<i>r<sup>eff</sup></i>	effective interest rate
<i>TC</i>	transaction costs
<i>u</i>	error term
<i>x</i>	household characteristics
<i>z</i>	loan attributes
$\varepsilon$	error term
$\gamma$	parameter vector in Probit model
$\sigma$	covariance in selection model

## 1 INTRODUCTION<sup>1</sup>

Borrowing costs (BC) in rural financial markets have traditionally been a concern for economists examining the restricted credit access of farmers in developing countries. In brief, the arguments put forward are (a) that fixed costs due to bureaucracy and regulation result in high loan-related, quantifiable BC, particularly for small farmers, (b) BC frequently make lending prohibitively costly and lead to credit rationing, (c) efficiency-improving credit innovations should therefore be introduced and markets liberalised. The demise of socialism in Central and Eastern Europe has led to a revival of these arguments, now aimed at explaining the difficulties farmers have in acquiring loans under conditions of transition. The objective of this paper is to conceptually re-examine the outlined argumentation and to conduct an econometric analysis of credit access and loan market BC based on cross-sectional survey data from Poland.

In the empirical part, we first identify by a Probit model which determinants are relevant for farmers' credit access. In this step, we systematically analyse the differences between borrowers and non-borrowers. In a second step we use a hedonic regression approach to analyse the impact of loan quality attributes on BC. BC encompass both nominal interest rates and in addition transaction costs (TC) on the basis of single loan contracts concluded between individual farmers and formal banks. Due to the scattered structure of farms and the relatively low degree of commercialisation of farming in Poland, problems of asymmetric information are likely to be of key relevance in determining BC. Furthermore, the government massively intervenes on rural credit markets by granting generous subsidies on agricultural loans. How this affects total BC of farmers is a further question to be addressed in the following.

The paper proceeds as follows. Chapter 2 briefly reviews the relevant literature on BC, and particularly their TC component. Chapter 3 introduces the notion of hedonic pricing on loan markets. Chapter 4 describes the characteristics of the Polish rural credit market and the extent of government intervention. In Chapter 5, the data source and the way of calculating key variables used in the analysis are presented. Chapter 6 contains the empirical results, and Chapter 7 summarises the findings and concludes with some policy implications.

## 2 BORROWING COSTS IN RURAL FINANCIAL MARKETS: A CRITICAL GLANCE AT THE LITERATURE

In several developing countries, credit programmes sponsored by governments or international donor organisations to boost agricultural production became of major importance after World War II (for an overview see ADAMS 1995). Many of these programmes were characterised by strict interest controls or ceilings on loan interest rates, additional subsidisation, and extensive loan targeting. The latter was pursued by making credit access conditional on the use of certain input or technology packages, supervision, or the affiliation with specific borrower groups. In the 1970s, due to an increasingly perceived failure of the existing policy measures, rural credit markets gained considerable attention from policy makers and researchers. Criticism was raised against extensive governmental regulation, which was blamed to produce a shortage or at least an undesired targeting of funds on rural loan markets. Credit was observed to be granted highly selectively and with much bureaucracy. One of the conse-

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<sup>1</sup> The authors are grateful to Catherine BENJAMIN, Jarmila CURTISS, Chantal LE MOUËL, and Peter WEINGARTEN for their valuable comments on an earlier draft of this paper, and to IAMO for hosting Laure LATRUFFE during a research stay in Halle. Financial support by IAMO and INRA is acknowledged.



quences was that particularly small farmers could not obtain as much credit as desired and, if available, had to rely on informal sources.

After the implementation of market reforms, many governments in Central and Eastern European Countries (CEECs) and the Former Soviet Union (FSU) also introduced new, seemingly market conform intervention measures. However, the policy instruments used resemble those in other countries, for example loan guarantees, interest subsidies, or the establishment of specialised lending institutions for agriculture (for an overview see OECD 1999). It is commonly assumed that BC on rural credit markets are of key relevance in ex-centrally planned economies and lead to similar distortions as noted previously (ADAMS 1993, pp. 13-14; SWINNEN and GOW 1999, p. 38).

It is commonly argued that *transaction costs*, hence the portion of BC not included in nominal interest rates, play a major role in the explanation of these observations. According to ADAMS and NEHMAN (1979, pp. 6-7), loan TC may include first of all loan charges collected by the lender beyond interest payments, such as application fees, forced purchase of other lender services, bribes, or compensatory balances, secondly costs due to negotiations with someone outside the formal lending agency, such as extension staff, local officials, or cosigners, and finally travel and time expenses which may be substantial in rural areas and at certain times, e.g. in planting or harvesting periods. TC arise in particular as a result of government regulation or extensive red tape in general (CUEVAS and GRAHAM 1984; LADMAN 1984). Since TC are often independent of the loan size (fixed costs), TC in percent of the loan volume are especially high for small loans which are demanded by small farms. It is hence assumed that TC are not allocated in fixed proportions among applicants and that high TC lead to *credit rationing* of small farms (CUEVAS and GRAHAM 1986). TC are likewise used to deter new or undesired clients (ADAMS 1993; ROJAS and ROJAS 1997). Drawing on these considerations, TC are regarded as a *measure of the operational efficiency* of financial markets (MEYER and CUEVAS 1992, p. 310; ADAMS 1995, p. 117). Authors of this tradition focus on the empirical applicability of the TC concept and provide detailed calculations of loan related TC, based on micro-data from several developing countries, which are put forward to support their arguments. A major policy implication proposed by this literature is to reduce financial market regulation and to introduce TC reducing financial innovations (e.g. MEYER and CUEVAS 1992; ADAMS 1993). Implicitly, a completely liberalised market is taken as the yardstick for evaluating the efficiency of existing credit markets (see the assessments by KRAHNEN and SCHMIDT 1994, pp. 20-21, and PETRICK 2003).

We believe that two propositions of the TC approach as described above are particularly problematic:

- Empirically measurable transaction costs lead to *rationing* of farmers (in the sense that they could have borrowed more were there no TC).
- TC can be used to *measure the efficiency of the institutional structure* of rural financial markets, and may be used in a normative way to compare alternative market arrangements, e.g. regulated versus liberalised credit markets.

In fact, the two propositions are interrelated, since credit rationing is usually regarded as an inefficiency compared with a theoretical first-best world (STIGLITZ and WEISS 1981; DE MEZA and WEBB 1987). A first objection is that the rhetoric of "rationing" used in the TC literature is at least inconsistent with the usual meaning that rationing is a *quantity* constraint (JAFFEE and STIGLITZ 1990, pp. 847-849). TC clearly influence the price terms of the loan, and therefore employ a conventional price rationing mechanism.

Secondly, regarding quantifiable TC as a measure of inefficiency runs into severe methodological problems. Indeed, the argument that institutional arrangements are chosen in a TC minimising way abounds in the debate (e.g. WILLIAMSON 1985). However, in the literature on comparative analysis of institutional structure or governance, TC are often used in an entirely abstract sense as indication of certain incentive and enforcement problems leading to welfare losses. In this view the focus is on the comparative analysis of *different* institutional arrangements, or the explanation of the *choice* of these arrangements. However, the problem that TC, which bear such a connotation of institutional choice, are difficult to measure seems to be as yet unresolved and might even be impossible to solve at all (SCHNEIDER 1987). The major problem of measuring TC when the institutional structure is to be explained is that the correct opportunity costs of any resource use are unknown. As SCHNEIDER (1987, p. 489) stresses, opportunity costs are observable only if a competitive equilibrium exists in reality. But in this case, any incentive and enforcement problems on loan markets are defined away, and there is no problem of institutional choice. On the other hand, if complex institutional structures as found in the real world are allowed, opportunity costs are unobserved. Measurement can hence only be based on the given institutional framework. TC can only be usefully quantified if the institutional structure is taken as given and by making certain pragmatic assumptions about opportunity costs of resource use. This is the practice of many of the empirical TC studies (e.g. ADAMS and NEHMAN 1979), in which TC are understood in a more technical sense as the real resource costs of using the existing credit market. However, it makes it impossible to use TC measurement in order to assess the efficiency of the rural financial system vis-à-vis an undefined (first-best) alternative. This does not imply that we wish to throw all insights gained by the literature on TC overboard. Our point is that an *empirical application* is methodologically difficult if one wishes to interpret TC in terms of an efficiency loss.

### 3 LOAN CONTRACTS IN A HEDONIC PRICING FRAMEWORK

In contrast to the previously summarised efficiency interpretation of TC on rural loan markets, we argue that a *hedonic pricing approach* provides a more appropriate alternative in terms of interpreting empirically measured TC. Hedonic prices were initially developed in the empirical literature on quality measurement (GRILICHES 1971; BERNDT 1991, pp. 102-149). The idea behind the concept is that goods are priced according to their inherent quality attributes. Hedonic prices are defined as the implicit prices of attributes and are revealed from observed prices of differentiated products and the specific amounts of characteristics associated with them (ROSEN 1974, p. 34). BALTENSPERGER (1976) was the first to apply this concept to loan markets, where interest rates are the observed prices and investment projects of borrowers with differing riskiness are the traded goods. BALTENSPERGER hence introduces a quality component into the loan contract, so that interest rates differ between different contracts. Borrowers are no longer price takers because the price is based on individual loan characteristics determining its quality, which can be influenced by the borrower.

In pursuing an empirical application of this approach, we extend BALTENSPERGER's (1976) basic argument in two directions. First, we regard total BC (including interest rate plus TC) as the appropriate price variable. Second, we argue that relevant quality attributes are not only the riskiness of the borrower's investment project as such, but also how difficult it is to reveal. Opposite to the above mentioned efficiency interpretation, the hedonic pricing approach is much more of a descriptive nature and does not involve a normative rhetoric. On the other hand, we explicitly wish to investigate the relevant *determinants* of BC and their varying contribution to empirically observed BC. By having a look at recent developments in the theory

of loan markets, it will become clear that this implies a rather broad meaning of quality attributes of loan contracts.

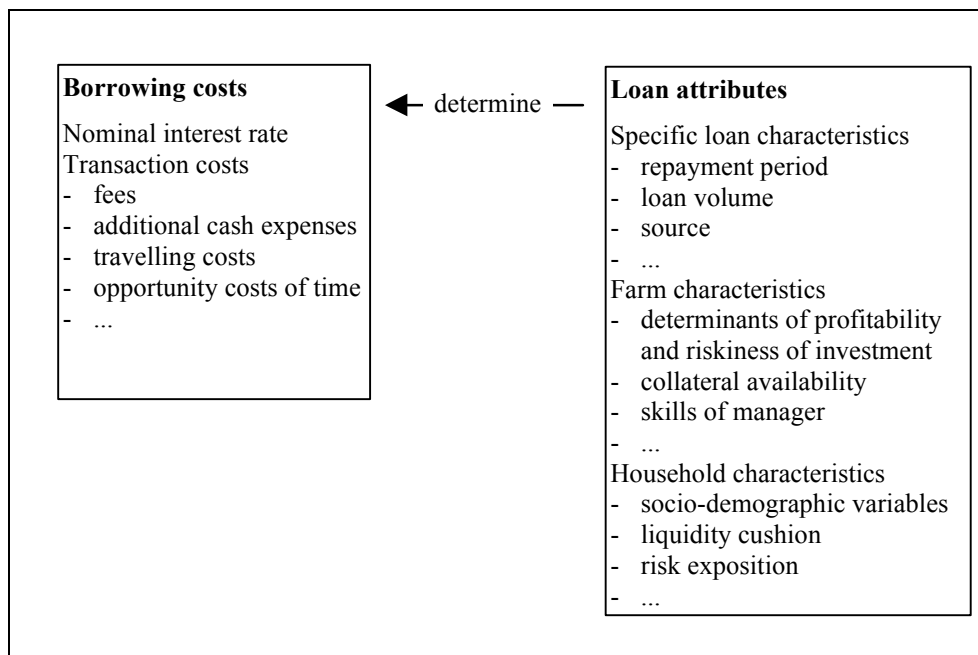
In recent years, a considerable body of theoretical literature has evolved explaining why borrowers are treated differently by banks and which attributes are likely to reduce or increase observed loan rates. It has become a common understanding that, even after interest rates have been adjusted for risk, loans still differ in several dimensions (JAFFEE and STIGLITZ 1990,

p. 867, mention the wealth of the borrower or his risk aversion). Although riskier loans are charged higher interest rates, it is stressed that it cannot be taken for granted that lenders *know* how risky a loan is. Central to the argumentation is the notion of an asymmetric distribution of information between borrower and lender, which leads to costly signalling and screening processes (following AKERLOF 1970). Broadly speaking, lenders need to actively sort out borrowers to avoid adverse selection and moral hazard, whereas borrowers have an incentive to signal their quality because otherwise they may experience excessively high interest rates or may even be denied loans (overviews of the theory are given by HOFF and STIGLITZ 1993, and FREIXAS and ROCHET 1997, pp. 91-135). Leading candidates among the mechanisms to overcome asymmetric information are collateral provision, third-party-guarantees, joint liability, and the borrower's abilities and reputation. Employing these instruments implies costs, some of which may be included in the nominal interest rate, while others may accrue in addition to that. From the perspective of the borrower, some of the additional costs are cash expenses (e.g. bank fees), others are travelling costs or opportunity costs of resources used for overcoming these informational asymmetries.<sup>2</sup> Riskiness of loans, difficulties in overcoming informational asymmetries, and high travelling costs will be particularly relevant in underdeveloped rural areas (BINSWANGER and ROSENZWEIG 1986). Whereas interest rates are usually risk adjusted, the resources spent on negotiating, screening, and travelling are commonly part of the additional TC component of the loan. As the literature outlined in Chapter 2 rightly stresses, the relevant price of the loan therefore consists of nominal interest rates *plus* additional TC. Following ADAMS and NEHMAN (1979), we call the sum of both the *borrowing costs* of acquiring a loan. The exact decomposition into nominal interest rate and TC may vary between lending sources and is of secondary importance, as long as all relevant costs are included.

Figure 1 summarises the various components of BC and the loan quality attributes relevant for the determination of BC. These costs encompass opportunity costs of labour, which are evaluated pragmatically by referring to plausible market wages. The box including the loan attributes contains a number of suggestions for observable loan quality attributes. First of all there are specific loan characteristics that are relevant for the determination of BC, such as repayment period or loan volume. In addition, we consider both farm and household characteristics as important attributes. Farm characteristics are relevant because borrowing is often motivated by financing needs for production purposes within the farming business. Furthermore, these attributes are largely responsible for the expected return and riskiness of investment in agriculture. However, due to the close linkages between production and consumption within a farm household, socio-economic and demographic characteristics of the associated farm family are likewise regarded as important. In particular, consumption smoothing and liquidity insurance must be regarded as relevant motives for borrowing (see BESLEY 1995). These suggestions will be taken up in the empirical application below.

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<sup>2</sup> The implicit assumption is that informational asymmetries are in fact overcome to some extent by costly signalling/screening activities. The case of pure credit rationing analysed by STIGLITZ and WEISS (1981), where the bank is completely unable to distinguish between borrowers, is therefore ruled out.

**Figure 1: Borrowing costs and determining loan attributes**

Source: Authors' depiction.

We assume that total BC are ultimately determined by the various quality attributes of the loan contract ( $z_m$ ), in the sense of a hedonic pricing mechanism. Since we express BC in the form of an effective interest rate  $r^{eff}$  which accounts for TC (see Section 5.2 below), the following equation becomes the basis of our analysis:

$$r^{eff} = r^{eff}(z_1, z_2, \dots, z_M) \quad (1)$$

The empirical analysis tries to quantify the importance of the quality attributes of loan contracts by estimating equation (1). First derivatives of this equation can be interpreted as implicit prices of these attributes. Furthermore, the regression also allows to rank the different attributes by their *relative* importance for explaining  $r^{eff}$ , based on their  $t$ -values.<sup>3</sup> This hedonic regression analysis hence produces the following information:

- it identifies the relevant determinants of BC (the loan attributes),
- it allows to guess the magnitude of the implicit prices (costs) of loan attributes (given by the coefficients) and
- their relative importance (given by the  $t$ -values).

It hence enables one to calculate the changes in effective interest rates depending on changing loan attributes and to determine the BC for new borrowers by considering their characteristics together with the estimated implicit prices. Furthermore, implicit prices principally could be used in an econometric analysis of demand and supply for loan attributes (following the considerations in ROSEN 1974), which is however not pursued here.

<sup>3</sup> Relative importance here means the relative size of the effect of a change in the regressor on the regressand, usually given by the 'standardised beta' of each regressor. It can be shown that the relative ranking of explanatory factors based on their  $t$ -values is the same as that based on standardised beta (DESAI and MELLOR 1993, p. 86).

#### 4 POLAND'S AGRICULTURAL CREDIT MARKET: STRUCTURE AND GOVERNMENT ACTION

As a basis for the subsequent empirical analysis, we present some background information on the Polish agricultural credit market in this section. Section 4.1 concentrates on farming structures and credit demand, whereas Section 4.2 reviews the supply side and the existing intervention measures in Poland.

##### 4.1 Demand structure

The organisation and structure of farming is varying across Poland, mainly due to historical reasons (this is discussed e.g. in JAKSCH et al. 1997; GÓRZ and KUREK 1998). In the southern and eastern parts of the country, a very small-structured peasant agriculture predominates, with more than 75% of all farms cultivating less than 5 ha of land (see GUS 2001). In contrast to this, the north and north-west of Poland is characterised by a more diverse farm structure with a higher share of large-scale farms, which is a reflection of the previous importance of state enterprises in agriculture (Państwowe Gospodarstwa Rolne, PGR). Accordingly, the average farm size decreases from the north-west to the south-east of Poland. As a peculiarity for CEECs, under the socialist regime, agriculture in Poland was never completely collectivised. State farms in the north had been mainly established as a result of the re-organisation of former German estates after World War II and administrative land allotment in subsequent years (for detailed analyses see PHILIPP 1983 and PETRICK and TYRAN 2002). However, after transition to a market economy, these state farms were liquidated or turned into the property of the Agricultural Property Agency of the State Treasury (Agencja Własności Rolnej Skarbu Państwa, AWRSP). This agency in turn sells or leases out the land (for an analysis see e.g. ZIETARA 1995 and MILCZAREK 2002).

Polish farms are suffering from a comparatively low profitability as compared to the existing European Union (EU)-member countries, which is primarily due to lower productivity levels and a less protective policy environment (PETRICK et al. 2002). Farms are not efficient in terms of quantity of inputs used, and in particular use labour and capital in excess (LATRUFFE et al. 2002). Indebtedness of farms generally is low (WORLD BANK 2001; PETRICK et al. 2002, p. 207), which is believed to be due to *farmers' limited access to finance*. On the other hand, it has been a widely held view among economists and politicians that this is one of the major obstacles to a more favourable development of the farm sector in Poland. Right from the outset of market reforms in Poland, experts stressed the crucial role of credit access. Supply of working capital was regarded as decisive for maintaining sufficient levels of input use and hence securing or even increasing productivity levels in agriculture (DEQUIN 1990, p. 488). Furthermore, it was pointed out that worsened availability of long-term loans led to a sharp decline in agricultural investment (KOWALSKI 1993, pp. 350, 353). At the same time, access to investment finance was seen as a precondition for modernisation and growth of farms (DEQUIN 1990, pp. 487-488). Public pressure on the government to improve credit access for farmers thus mounted.

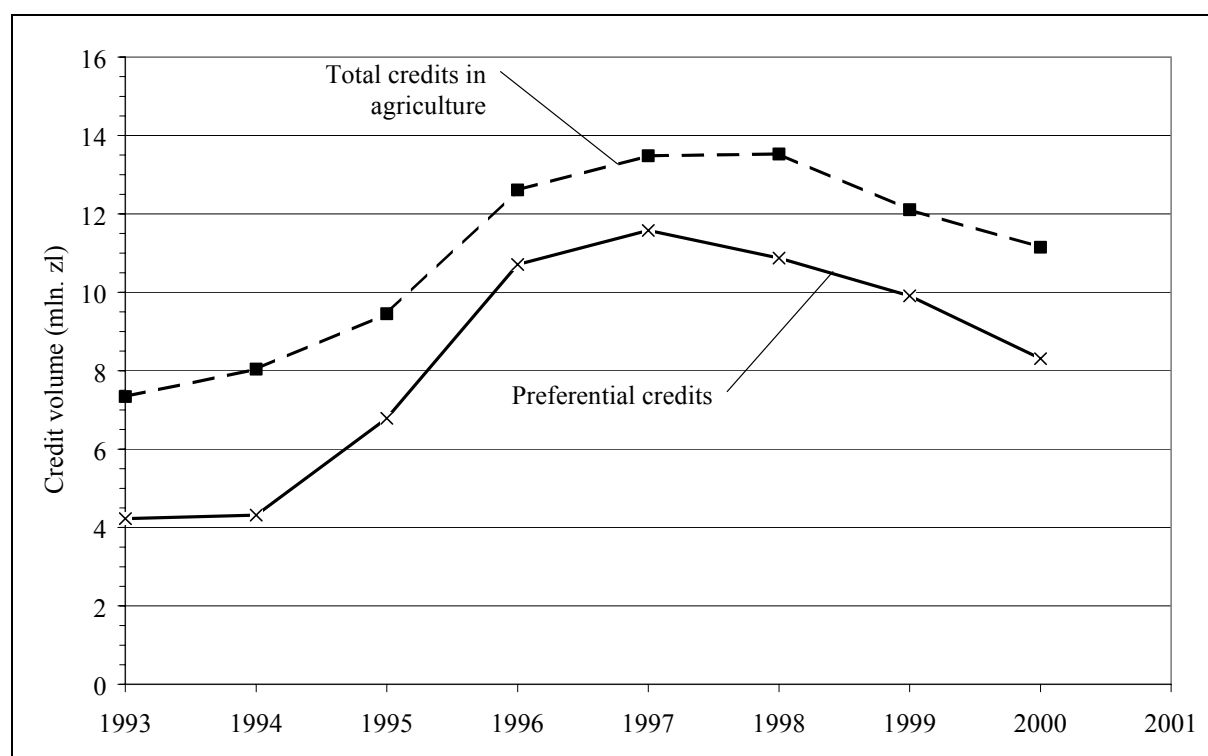
##### 4.2 Supply structure and government intervention on rural credit markets

The major form of state intervention on rural credit markets in Poland is the extension of preferential loans to agricultural producers. Borrowers pay only a part of the commercial interest rate, whereas the remainder is paid by the government. There is hence a *subsidy on interest rates*. A second form of intervention is by loan guarantees. However, the budgetary importance of the latter is small as compared with the subsidies (less than one tenth). Furthermore, guarantees are primarily used for specific price stabilisation schemes, and are almost exclusively granted to farms in the public sector (at least until 1996, according to CHRISTENSEN and

LACROIX 1997, pp. 18-19). We therefore focus only on the interest subsidy programme in the following.

Since 1994, preferential credits have been handed out by the Agency for Restructuring and Modernisation of Agriculture (ARiMR), which in the following years provided more than 30 different credit lines for various purposes (CZERWIŃSKA-KAYZER 2000, p. 9). These credit lines comprised loans for working capital, basic investment, land purchases, investments by young and beginning farmers, sector programs (milk, cattle, poultry, etc.), loans to resume farm production, loans to restructure debts, and also loans to create non-farm jobs in urban and municipal areas (CHRISTENSEN and LACROIX 1997, p. 18). Special credit schemes aiming at market stabilisation for agricultural products included subsidised credit for cereal purchases and commodity loans for large farmers who store their harvest. The government apparently aimed at targeting the different credit lines by varying the volume and the extent of subsidisation (POGANIETZ and WILDERMUTH 1999, p. 537). The two most voluminous credit lines were for working capital and basic investment. In 1999, subsidies on working capital loans amounted to 423 mln. zł, whereas investment loans were supported by 771 mln. zł (OECD 2000, pp. 106-107). Not regarding expenses for the farmers' social insurance fund, these payments made up 38 percent of the budget of the Ministry of Agriculture and Rural Development (Ministerstwo Rolnictwa i Rozwoju Wsi, MRiRW) (see MRiRW 2000).

**Figure 2: Outstanding volume of total and preferential credits in the agricultural sector 1993-2000 (in 1999 prices)**



Notes: Credit volume as outstanding on 31 December (1993-1999) or 31 March (2000), respectively. Monetary values in 1999 prices, using the consumer price index. 1 zł = .237 euro in 1999.

Source: Authors' calculations based on unpublished data of National Bank of Poland.

Interest rates vary according to loan category. For each loan type, ARiMR establishes a maximum rate that a bank can charge, which is a multiple of the bank's refinance rate. Borrowers then pay one quarter to one half of this maximum rate, according to the loan type, and ARiMR pays the rest (CHRISTENSEN and LACROIX 1997, p. 19).

Figure 2 depicts the outstanding amounts of total and preferential credits in the agricultural sector between 1993 and 2000. Monetary values are given in 1999 prices. The foundation of ARiMR marked the start of a phase of rapid credit expansion, with growth rates of the preferential credit volume of almost 60 percent in 1995 and 1996. In 1997, the volume of subsidised credits reached a peak, whereas it declined in the following years. This is consistent with the fact that the number of credit lines for agriculture and the volume of public funds earmarked for subsidising interest rates were considerably cut down in 1998 (CZERWIŃSKA-KAYZER 2000, p. 12).

In the phase of credit expansion, the share of preferential credits in the total credit volume temporarily increased from 53.7 percent in 1994 to 85.9 percent in 1997, whereas it decreased afterwards. This is evidence for a crowding-out effect, which means that borrowers turned to the cheaper government loans although they would have also borrowed under fully commercial terms. However, it seems that the total amount of credit outstanding was mainly driven by the changes in governmentally sponsored credit supply.

In the first half of 1998, at the peak of intervention, preferential interest rates ranged between 6.13 and 15.31 percent p.a. In the same period, the inflation rate was at 13.7 percent, and the difference between subsidised and non-subsidised interest rates ranged between 17 and 25 percentage points. Interest subsidies hence led to a substantial reduction of interest costs for farmers, even implying negative real interest rates (all figures taken from POGANIETZ and WILDERMUTH 1999, p. 537).

Preferential loans under the government programme are extended through the existing network of banks. In Poland, there are two types of lending organisations specialised on agriculture, namely the Bank for Food Economy (Bank Gospodarki Żywnościowej, BGŻ), and the system of cooperative banks (KLANK 1999). However, preferential credits can also be received via most of the commercial banks in Poland. The BGŻ was the primary channel for financing state-managed agriculture during the socialist period, which implied that the bank inherited quite a number of bad loans in the course of market reforms. Similar to other formerly state-owned banks in Poland, there were several attempts to comprehensively restructure or liquidate the BGŻ during the past decade. However, this was successfully blocked, inter alia by agricultural lobby groups. Local *cooperative banks* had often been founded prior to World War II, and existed under the umbrella of the BGŻ during socialism. In 1990, most of them left the BGŻ in order to form regionally oriented cooperative banking structures (WENZELER 1999, pp. 128-129; 196-200). Even so, their reconsolidation has remained incomplete to date. Furthermore, KHITARISHVILI (2000) provides evidence based on a stochastic frontier analysis that the efficiency of Polish cooperative banks lags behind international standards. Whereas the general privatisation and liberalisation activities in the Polish banking sector have proven largely successful (RUTKOWSKA 1998, p. 66), agricultural banking is still an exception. Recent years have seen a general decrease of the importance of the traditional rural financial institutions (BGŻ and cooperative banks), whereas commercial banks – partly backed by foreign investors – expanded into rural areas (KLANK 1999, p. 41). A relevant market share is also held by the biggest retail bank in Poland, the governmentally controlled savings bank PKO BP (Powszechna Kasa Oszczędności Bank Polski).

The procedure for obtaining loans is as follows. Prospective borrowers have to submit a loan application at a local bank branch, together with a business plan describing the envisaged use of the loan. The latter is usually evaluated by the public extension service ODR (Ośrodek Doradztwa Rolniczego, Extension Centre of Agriculture) prior to loan application. The bank then applies for subsidy payments at ARiMR. The bank bears the full default risk of the loan and therefore is also responsible for screening and monitoring of borrowers as well as possi-

ble enforcement of repayment or liquidation of collateral (POGANIETZ and WILDERMUTH 1999, p. 539). In contrast to other transition countries, mortgaging loans is less of a problem because most of the land remained in private property during the period of socialism. Accordingly, mortgaging is currently a commonly used instrument to collateralise loans (PROSTERMAN and ROLFES 2000, pp. 128-129). However, as stressed by KARCZ (1998, p. 96), the reliability or reputation of a borrower as indicated by previous punctual repayment of loans is at least as important for obtaining credit as is the sufficient availability of collateral.

With regard to the empirical analysis of BC, the effects of government intervention on these costs is of particular interest. It seems clear that interest subsidies reduce the nominal interest rate for borrowers. Much less evident is the effect on total BC, since applying for government funds may involve additional TC due to additional paperwork and covenants. A further interesting question is whether the choice of the bank influences BC, conditional on the other loan contract attributes. We will investigate these issues in the subsequent econometric analysis.

## **5 DATABASE**

### **5.1 Data source**

The data source for the analyses in this paper is the 'IAMO Poland farm survey 2000', which is a cross-sectional farm survey conducted in the boundaries of the former Szczecin, Tarnów, and Rzeszów voivodships existing prior to the administrative reform of 1. January 1999. The survey was carried out in 2000 and contains data related to the economic outcomes of the years 1997-1999.

The survey is based on a random sample of farms in the database of the official extension service ODR. The database consists only of farms that show at least some degree of commercialisation and market integration and that account for the bulk of the traded agricultural produce in the research area. The sample consists of 464 farms: 120 from Szczecin, 108 from Tarnów, and 236 from Rzeszów. Within the given geographic boundaries of the three voivodships, the sample is stratified in one stage. The strata are identical with administrative districts (powiat). Further details on sampling issues, organisation of data collection and a reprint of the questionnaire can be found in PETRICK (2001).

The specific strength of this database is that it entails detailed information about loans acquired by farmers in the years 1997-1999. This includes relevant data on interest rates, repayment period, and lending source, but also on all kinds of loan-related TC, such as fees, additional paperwork, waiting time, number of visits to the bank, and travelling expenses. There are 485 contracts in the database, including all types of loans, i.e. working capital, consumption, and investment loans. 365 loan contracts were recorded with sufficient detail to calculate a TC measure, among which almost 70 percent were taken under the government programme.

### **5.2 Calculation of borrowing costs and effective interest rate**

Finding an appropriate measure of the total BC is of central importance for the aim of this paper. However, there are several critical points in constructing such a measure: (a) the necessary data must be available on a per contract basis in sufficient detail, (b) resources used for negotiating the loan contract must somehow be valued so that they can be aggregated to a total cost variable, and (c) the question must be addressed how fixed TC which arise only once can be distributed over a given repayment period of the loan and be combined with periodic interest payments.



As indicated earlier, the analysis draws on a comprehensive database including transaction-relevant information for 365 loans negotiated by Polish farmers between 1997 and 1999. The information might usefully be decomposed into two broad groups of TC, which we call *transport costs* and *signalling costs*. Transport costs depend on the distance between farm and bank and the number of visits as stated in the questionnaire, and signalling costs comprise actual cash expenses, and the time spent waiting at the bank, all as given in the questionnaire. We call them signalling costs because they are related to the particularities of the loan contract (as opposed to conventional trade agreements without asymmetric information) and have to be borne by the borrower. Following the earlier empirical TC literature (e.g. ADAMS and NEHMAN 1979, p. 172), we valued the time spent for transport and signalling activities with an hypothetical wage for farm management (see the discussion in Chapter 2).

More specifically, transport costs are defined as the sum of direct expenses for travelling plus opportunity costs of time spent for travelling. Both are based on the distance between farm and bank from which the loan was received, as stated in the interviews. Time spent for travelling and travel costs were then calculated according to average numbers given by GUS (2000, p. 328), while opportunity costs of time were calculated according to results from the IAMO survey.<sup>4</sup> Signalling costs consist of cash expenses required by the bank in addition to the interest rate (various fees, insurances) plus opportunity costs of time expenses for negotiating at the bank as given in the interviews. Both components sum up to (total) transaction costs per loan contract.

To obtain a measure of total BC, TC have to be combined with nominal interest rates. The problem here is that interest payments are due on a periodical basis (for example annually), whereas TC accrue only once (usually when the loan contract is negotiated). It was however desirable to have a single variable representing the total BC in a plausible way. We therefore chose an internal rate of return (IRR) method for computing this variable, following the suggestion in ROJAS and ROJAS (1997). The idea is to compare the periodical payments of the borrower (consisting of repayment of the principal plus interest) based on the *nominal* interest rate  $r$  as fixed in the loan contract with the initial amount borrowed *minus* fixed TC. This yields an *effective interest rate* denoted  $r^{eff}$  as introduced above, which takes into account total BC as follows.  $r^{eff}$  is the rate at which the discounted value of all periodical payments  $A_t$  (based on the nominal interest rate) equals the initial loan volume  $L$  minus fixed TC:

$$\sum_{t=1}^T A_t (1 + r^{eff})^{-t} = L - TC \quad (2)$$

In this equation,  $t$  denotes the current period and  $T$  is the total repayment period of the loan. The IRR was computed with a precision of five digits after the decimal point. The relation between the calculated  $r^{eff}$  and the nominal interest rate  $r$  as negotiated in the loan contract is as follows:

$$r^{eff} \geq r \quad (3)$$

<sup>4</sup> A km of travelling is valued with .12 zł according to the travel fare of slow PKS bus for the 41-50 km distance in 1999. Travelling time is calculated with an average speed of 50 km/hour or .02 hours/km. Opportunity costs of time are valued with 6 zł/hour, which consists of 5 zł/hour as the average salary of an agricultural worker as given in the survey results, plus an (arbitrary) extra premium of 20 percent for management skills of the farm head.

Equality is given for  $TC=0$ .  $r^{eff}$  is taken as the proxy for total BC in the following. It is hence possible to compare the BC of loans with different repayment periods based on this variable. One important effect of the outlined procedure is that two loans with the same nominal interest rates and the same fixed TC but different repayment periods also differ in their effective interest rate. The loan with the longer repayment period will display a lower effective interest rate – which is a consequence of the fixed cost character of TC.

For reasons of simplicity, we assumed that interest and principal repayment was made in the form of constant annuity payments throughout the sample.<sup>5</sup> Although some of the recorded loan contracts divert from this rule (for example because interest payments were made in separation from principal repayment), we regard the possible inexactness in the calculation of the effective interest rate as negligible.

**Table 1: Transaction costs and interest rates of loans**

	<i>Mean</i>	<i>Minimum</i>	<i>Maximum</i>	<i>Valid observations</i>
Transport costs per loan contract (zł)	13.8	0.0	192.0	365
Signalling costs per loan contract (zł)	662.3	0.0	15,740.0	365
Transaction costs per loan contract (zł)	676.1	3.0	15,846.6	365
Nominal interest rate of loan (%)	9.0	3.0	32.0	365
Effective interest rate including transaction costs (%)	11.9	3.6	97.7	365

Notes: Transaction costs are the sum of transport costs and signalling costs. Effective interest rate calculated according to IRR method, see text. Table based on observations with non-missing values for effective interest rate.

Source: Authors' calculations.

Table 1 displays a number of descriptive statistics of the effective interest rate calculations. It shows that, on average, signalling costs contribute the overwhelming part of total TC per loan (98 percent). On average, nominal interest rates are marked up by almost one third if TC are considered, which underlines the importance of the latter.

## 6 EMPIRICAL FINDINGS ON CREDIT ACCESS AND HEDONIC PRICING OF LOANS IN RURAL POLAND

The empirical approach in this study consists of two stages, which is necessitated by the fact that BC are only observed for borrowers. This introduces a possible selectivity bias, since borrowers might not be a random subsample of all farms. A comprehensive evaluation of borrowing costs must include an analysis of the determinants of becoming a borrower. We therefore employ the selectivity model due to HECKMAN (1979).

In the first stage, we examine the determinants of the decision to borrow, which is a qualitative choice variable (borrower yes/no). This model takes the farm household as a unit of observation. Besides addressing the selectivity problem, this first step also gives interesting results as such, as the borrowing decision can be interpreted as a proxy for credit access. In the second stage, we wish to identify the relevant attributes of loan contracts which determine total BC. This is the hedonic pricing model as introduced above (equation (1)). Since several

<sup>5</sup> In case that the repayment period was equal to or more than 12 months, we assumed constant annual payments, otherwise constant monthly payments were assumed. Note that the number of instalments in a given period does not affect the effective interest rate as long as there are always constant annuity payments.

borrowers acquired more than one loan in the reporting period, we sometimes had available several loans per borrower in the second stage regression. Because we did not want to discard information on loan contracts, and because a choice between the loan contracts available per borrower would have been largely arbitrary, we included all loan contracts with sufficient information in the second stage. The single loan contract is hence the unit of observation in the second stage. Each loan contract is associated with a vector of household characteristics, which are used as explanatory variables. The Inverse Mills Ratio (IMR) computed from the first stage results is included as separate regressor in the second stage, which corrects for selectivity. If there are several loans made by the same farm household, household characteristics including the IMR are identical for these loans.

### 6.1 Access to credit

Farmers' access to credit is estimated by using a Probit model where the dependent variable  $b_i$  is a dichotomous (1, 0) variable indicating whether the  $i$ -th farm household is a borrower or not. Credit access is assumed to be explained by a set of household characteristics  $x_i$ , as given by the following equation:

$$b_i = \gamma' x_i + u_i, \quad (4)$$

where  $\gamma$  is a vector of parameters to be estimated, and  $u_i$  is a random error term. In the sample, 79 percent of respondents received at least one loan in 1997-1999 and are hence classified as borrowers.

It should be stressed that access to credit is both influenced by the farmer's desire to obtain the loan and the lender's willingness to extend it. As explained in Chapter 3, this usually involves a signalling and screening procedure in order to communicate information about the riskiness of the loan. Those farm and household characteristics which can serve this purpose are likely to be significant determinants of credit access.

The following farm characteristics were chosen, with expected signs in parentheses. Total land owned (+) is used as a proxy for the volume of collateralisable wealth. The number of years of farming practice (?) is included to represent the experience of the farmer. It might however also indicate the stage of the farmer in his life cycle. The former interpretation suggests a positive sign (experienced farmers are more likely to obtain loans), whereas the latter might imply the opposite (younger farmers are more dynamic in expanding their farm and therefore borrow more frequently). Three further dummy variables are used to indicate the skills of the farmer and how professional his business is managed: farm has permanent book-keeping (+), farmer previously participated in additional training courses (+), and farmer owns a personal computer (PC) (+). Book-keeping farms are commonly those which have a more commercial orientation. Similarly, training courses are usually attended by farmers who are particularly active in developing their business. Owning a PC is considered as an information means. Potential borrowers are farmers who have more information about the available loans as well as about the different technology they could use to improve their production. Descriptive statistics of all variables used in the regression are displayed in Table 2.

**Table 2: Description of variables used in the first stage Probit estimation**

<i>Variable</i>	<i>Mean</i>	<i>Std. Dev.</i>	<i>Minimum</i>	<i>Maximum</i>	<i>Valid observations</i>
Borrower (dummy)	.8	.4	.0	1.0	447
<i>Farm characteristics</i>					
Total land owned (ha)	15.4	32.0	.0	478.9	464
Farming practice (years)	21.9	10.0	.0	60.0	462
Permanent book-keeping (dummy)	.4	.5	.0	1.0	464
Previous participation in training courses (dummy)	.9	.3	.0	1.0	464
Farmer owns personal computer (dummy)	.2	.4	.0	1.0	462
<i>Household characteristics</i>					
Adults in household (no.)	3.4	1.4	1.0	8.0	464
Member of co-op bank (dummy)	.6	.5	.0	1.0	464
Experienced harvest failure (dummy)	.3	.5	.0	1.0	452
Experienced loss of employment (dummy)	.1	.3	.0	1.0	451
Household members work off-farm (dummy)	.5	.5	.0	1.0	452

Note: Missing observations were row-wise skipped.

Source: Authors' calculations based on IAMO Poland farm survey 2000.

Among the household characteristics, the number of adults living in the household (+) is the only metric variable. The positive sign is expected because more adult household members are assumed to have a higher liquidity demand. Furthermore, a dummy taking the value of one if the household head is a registered member of a co-operative bank and zero otherwise (+) is regarded as indicating a general interest in borrowing and a closer social proximity to the bank, which makes borrowing more likely. We also include a number of dummies in order to capture liquidity insurance motives: household experienced harvest failure (+), household experienced loss of employment (+) and some household members work off-farm (-). In case of emergency events, borrowing becomes more likely, whereas off-farm work can be interpreted as providing liquidity insurance.<sup>6</sup>

Intuitively the expected BC are likely to influence the decision to borrow. Although BC are not observed for non-borrowers, the effect of expected BC is taken into account by including into the first stage equation the relevant *determinants* of BC resulting of the second step (see the discussion in Section 6.2).<sup>7</sup>

<sup>6</sup> There are a number of explanatory variables which might possibly be endogenous to the borrowing decision and thus could cause biased estimates. Notable candidates are land owned and membership in a co-op bank, to a lesser extent also permanent book-keeping and participation in training courses. It cannot totally be ruled out in each case that co-op membership, book-keeping, and training attendance are in fact decisions that are taken simultaneously with the borrowing decision (or even as a consequence of it). Some biases may therefore result. However, for land owned a substantial bias is unlikely, since only about 16 percent of respondents bought any land in 1997-1999, and land purchases commonly were quite limited in volume.

<sup>7</sup> Past experience with borrowing might also influence the current borrowing decision. We therefore included two variables representing respectively previous defaults and rescheduled loans but they were non-significant.

Table 3 contains the results of the Probit estimation. The total model is highly significant, as shown by the Chi-squared statistic. Furthermore, most of the coefficients have the expected sign and are significantly different from zero. In the further discussion, we focus on the marginal effects computed at sample means and displayed in percentage points in the right-hand column. For the interpretation of the marginal effects of the explanatory dummies it is useful to imagine a division of the sample into two subgroups, one for which the dummy takes the value of one, and one for the other. In this case, the marginal effect of the independent dummy variable is the difference of the probability of being a borrower between the two subgroups, estimated at the means of all other independent variables.

**Table 3: Probit estimates of the probability of being a borrower**

	<i>Coefficient</i>	<i>t-value</i>	<i>Significance</i>	<i>Marginal effect</i>
Constant	-.369	-.975	.330	–
<i>Farm characteristics</i>				
Total land owned (ha)	.018	2.212	.027	.381
Farming practice (years)	-.026	-2.994	.003	-.540
Permanent book-keeping (dummy)	.738	3.692	<.001	14.299
Previous participation in training courses (dummy)	.629	2.892	.004	16.528
Farmer owns personal computer (dummy)	-.683	-3.530	<.001	-17.328
<i>Household characteristics</i>				
Adults in household (no.)	.155	2.351	.019	3.205
Member of co-op bank (dummy)	.972	5.638	<.001	22.608
Experienced harvest failure (dummy)	.448	2.483	.013	8.531
Experienced loss of employment (dummy)	-.131	-.486	.627	-2.873
Household members work off-farm (dummy)	-.314	-1.851	.064	-6.589
<i>Chi-squared (significance)</i>			132.1 (<.001)	
<i>Observations</i>			432	

Note: Marginal effects in percentage points, calculated at sample means.

Source: Authors' calculations based on IAMO Poland farm survey 2000.

The signs of the estimated coefficients widely support the above expectations. Of notable importance for a borrowing decision are the available collateral (measured as land owned) and how professional the farm enterprise is managed (expressed by the dummies for book-keeping and additional training). All other things equal, one more hectare of land owned raises the borrowing probability by .4 percentage point. Having permanent book-keeping increases the probability of being a borrower by 14 percentage points, participation in additional training by 17 percentage points. The years of farming practice have a negative influence, which can be interpreted as an indication that younger farmers are more keen on borrowing and/or are also more likely to be successful when applying at the bank. One more year of farming practice lowers the borrowing probability by .5 percentage point on average.

Only the coefficient of the dummy indicating ownership of a PC has an unexpected though significant sign: owning a PC reduces the likelihood of borrowing by 17 percentage points on average. The result is not due to particular extreme cases, since 21 percent of the farmers in-

cluded in the estimation own a PC. One possible explanation could be that farmers owning a PC are so advanced that they satisfied their borrowing needs already prior to 1997.

Among the household characteristics, membership in a co-operative bank is of overwhelming importance for the borrowing decision (as shown by its  $t$ -value). It increases the likelihood of being a borrower by 23 percentage points at the means of all other variables. A further significant determinant is the number of adults, supporting the above liquidity demand interpretation. On average, one more adult adds 3 percentage points to the probability of being a borrower. Two of the three liquidity insurance dummies are significant as well, namely experience of a harvest failure and off-farm employment (probability change by 9 and  $-7$  percentage points, respectively). Experiencing a job loss apparently does not significantly affect the borrowing decision.

In summary, the results are quite in line with theoretical expectations and draw a plausible picture of Polish farm households' credit access. In particular, it has been shown that the availability of devices to overcome information asymmetries and to reduce the default risk of a loan are of key importance for becoming a borrower. Furthermore, liquidity demand and insurance by the household are central determinants.

## 6.2 The hedonic price of credit

The hedonic pricing model is estimated on the subsample of respondents classified as borrowers, as analysed in the first-stage estimation above. Furthermore, all loans taken between 1997 and 1999 are included. The following equation is therefore estimated in the second-stage hedonic pricing model:

$$r_j^{eff} = r_j^{eff}(z_i, z_j) + \varepsilon_j \text{ iff } \gamma' x_i + u_i > 0, \quad (5)$$

where  $\varepsilon_j$  is a random error term. The effective interest rate  $r_j^{eff}$  is observed for each of the  $j = 1..J$  loan contracts. The set of explanatory variables consists of a vector of household characteristics  $z_i$ , as in the Probit model, and a vector of loan-specific characteristics  $z_j$ , e.g. repayment period and loan volume.  $z_i$  is identical for all loan contracts negotiated by the same farm household, whereas  $z_j$  differs for all loan contracts.

In (5),  $\varepsilon_j$  and  $u_i$  are supposed to have a bivariate normal distribution with zero means and covariance  $\sigma$ . Conventional Ordinary Least Squares (OLS) estimates of the second stage are biased if  $\sigma \neq 0$ . Whether such a bias is present can be tested (and potentially accounted for) by including the IMR estimated from the first-stage Probit model (4) in the second-stage equation (5) and then proceeding with OLS (HECKMAN 1979). The obtained coefficient for the IMR can be regarded as an estimate of  $\sigma$ , so that the conventional  $t$ -test allows to decide whether  $\sigma$  is significantly different from zero and selectivity bias must be expected (this is shown by VERBEEK 2000, pp. 207-212, where further details on the procedure are provided as well).

As explained above, the dependent variable in the second-stage regression is the effective interest rate (in percentage p.a.) as a measure of total BC (for descriptive statistics see Table 4). The following loan characteristics were included in (5), with expected signs in parentheses. The repayment period of the loan in months (?) and the loan volume in thousand zł (?) are explanatory loan characteristics measured on a metric scale (expected signs in parentheses). Loans with a long repayment period and a large volume are usually regarded as riskier, which should be reflected in higher interest rates. However, since BC include TC with a potentially

fixed character, larger loans and loans with a long repayment period might also bear lower total BC. In addition, the relationship might be influenced by the government program if it specifically targets at loans with certain repayment periods or loan volumes. The overall effect of government intervention is captured by a dummy indicating whether the loan is taken under the government subsidy programme (?). Again, the sign is indeterminate: interest subsidies clearly reduce nominal interest rates, however, extensive paperwork due to programme application may tend to increase the TC component of total BC. A further dummy takes the value of one if the loan was used for automobile purchases and zero otherwise. Automobile loans are not covered by the subsidy programme and must be regarded as exceptional events (Table 4). *Ceteris paribus*, taking a loan for automobile purchases is therefore likely to increase the BC, unless nominal interest subsidies for non-automobile purchases are offset by increased TC.

**Table 4: Description of variables used in the second-stage hedonic regression**

<i>Variable</i>	<i>Mean</i>	<i>Std. Dev.</i>	<i>Minimum</i>	<i>Maximum</i>	<i>Valid observations</i>
Effective interest rate (%)	11.9	8.9	3.6	97.7	365
<i>Loan characteristics</i>					
Repayment period (months)	41.0	37.7	1.0	180.0	445
Loan volume (ths. zł)	38.8	87.0	<.1	950.0	453
Loan under the government programme (dummy)	.7	.5	.0	1.0	430
Loan for automobile purchase (dummy)	<.1	.2	.0	1.0	467
Loan from co-operative bank (dummy)	.6	.5	.0	1.0	485
Loan from BGŻ (dummy)	.2	.4	.0	1.0	485
Loan from PKO (dummy)	.1	.3	.0	1.0	485
<i>Farm characteristics</i>					
Total land owned (ha)	20.4	44.8	.0	478.9	485
Farming practice (years)	20.5	9.3	2.0	50.0	483
Permanent book-keeping (dummy)	.5	.5	.0	1.0	485
Previous participation in training courses (dummy)	.9	.3	.0	1.0	485
Farmer owns personal computer (dummy)	.2	.4	.0	1.0	483
<i>Household characteristics</i>					
Member of co-op bank (dummy)	.7	.5	.0	1.0	485
Experienced harvest failure (dummy)	.3	.5	.0	1.0	467
Experienced loss of employment (dummy)	.1	.3	.0	1.0	467
Household members work off-farm (dummy)	.4	.5	.0	1.0	467

Note: Missing observations were row-wise skipped.

Source: Authors' calculations based on IAMO Poland farm survey 2000.

A further important policy question is whether the choice of the bank affects total BC. We therefore distinguished four types of banks (see Section 4.2 above): (a) the co-operative banks, (b) the governmentally-owned agricultural sector bank BGŻ, (c) the savings bank PKO, and (d) all other banks (which consist mainly of other commercial banks). Consequently, we included separate dummies for the first three types of banks, thus measuring the effect of borrowing from one of these sources vis-à-vis the fourth type.

A critical point in estimating the above selectivity model is to separately identify the equations in both stages. It is therefore desirable to have different sets of explanatory variables in both estimations. At the same time, exclusion of certain variables in either of the two stages is commonly difficult to justify on theoretical grounds. In our model, the second-stage equation is quite naturally identified by the inclusion of  $z_j$ . To identify the Probit, we excluded the variable indicating the number of adults in the household from  $z_i$  in the second stage. Apart from that, all farm and household characteristics in the second-stage regression are identical to the Probit model. The expected signs are generally just opposite to what was suggested in the Probit model, because factors that make a borrowing outcome more likely also tend to drive down BC. The two 'emergency-dummies' among the household characteristics (experienced harvest failure and loss of employment) can be interpreted as indicating a sudden demand for credit, which usually increases costs. Furthermore, households in an emergency situation might be regarded as riskier borrowers for the bank, because their liquidity cushion is likely to be small. Off-farm employment of household members might be regarded as increasing this cushion (as argued for the Probit model), which should reduce BC.<sup>8</sup>

The results of the second-stage estimation are presented in Table 5. Explorative regressions using a linear model revealed a considerable extent of heteroscedasticity in the results. We therefore resorted to a double-log model, which is commonly used in hedonic regression analysis. After taking natural logarithms of the dependent and all independent metric variables in the regression, the heteroscedasticity problem disappeared. The coefficients of the OLS regression therefore display the relative changes of the dependent variable in the sense of an elasticity. It should be stressed that these relative changes refer to an explained variable which is already a relative magnitude (effective interest rate in annual percent). In line with the considerations in Chapter 3, we are particularly interested in the implicit prices of loan attributes, which are in our mind most usefully expressed in *marginal changes in percentage points* of the dependent variable. This information is given in the most right column of Table 5. Since the double-log model implies marginal effects that vary with the size of the explanatory variables, marginal effects are given at sample means.

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<sup>8</sup> Note that simultaneity is probably much less problematic here than in the Probit equation. This is due to the fact that total BC are to a large extent set by the bank, whereas loan attributes are determined by borrower behaviour.



**Table 5: Results of the effective interest rate hedonic regression model**

<i>Variable</i>	<i>Coefficient</i>	<i>t-value</i>	<i>Significance</i>	<i>Implicit price in percentage points (marginal effect)</i>
Constant	2.549	12.872	<.001	–
<i>Loan characteristics</i>				
Repayment period (months) <sup>a</sup>	-.059	-2.135	.034	-.017
Loan volume (ths. zł) <sup>a</sup>	<.001	.016	.988	.000
Loan under the government programme (dummy)	-.122	-2.505	.013	-1.447
Loan for automobile purchase (dummy)	.361	3.764	<.001	4.290
Loan from co-operative bank (dummy)	-.154	-2.346	.020	-1.826
Loan from BGŻ (dummy)	-.134	-1.647	.101	-1.592
Loan from PKO (dummy)	-.244	-2.447	.015	-2.901
<i>Farm characteristics</i>				
Total land owned (ha) <sup>a</sup>	-.078	-2.944	.004	-.046
Farming practice (years) <sup>a</sup>	.080	1.898	.059	.046
Permanent book-keeping (dummy)	-.119	-2.087	.038	-1.410
Previous participation in training courses (dummy)	.114	1.355	.176	1.355
Farmer owns personal computer (dummy)	.027	.451	.652	.323
<i>Household characteristics</i>				
Member of co-op bank (dummy)	.007	.102	.919	.079
Experienced harvest failure (dummy)	.001	.023	.982	.012
Experienced loss of employment (dummy)	.195	2.532	.012	2.319
Household members work off-farm (dummy)	.117	2.606	.010	1.389
Inverse Mills Ratio	-.012	-.078	.938	–
<i>F-value (significance)</i>		11.23 (<.001)		
Adjusted R <sup>2</sup>		.358		
Observations		313		

Notes: Dependent variable: log effective interest rate. <sup>a</sup> Variable enters the regression in log form. Implicit prices calculated at sample means.

Source: Authors' calculations based on IAMO Poland farm survey 2000.

Table 5 shows that the majority of coefficients are significantly different from zero at least at the five percent level. The adjusted R<sup>2</sup> has an order of magnitude that is quite acceptable for micro data.

Long-term loans are significantly less costly than short-term loans. This is plausible because single expenses for TC become less relevant for total BC the longer the repayment period is, whereas nominal interest rates are charged on a periodical basis. There is hence no apparent risk premium for long-term loans. Furthermore, long-term investment credit is particularly

heavily subsidised (POGANIETZ and WILDERMUTH 1999, p. 537).<sup>9</sup> All other things equal, prolonging the repayment period of the loan for one year reduces total BC by approximately .2 percentage point.

In contrast, the loan volume has no significant effect on total BC. This can be explained by the observation that loans are commonly charged a fee in percentage of the loan volume (one or two percent are frequently reported in the sample). Total BC expressed in percent therefore remain unaffected by an increase in loan volume.

Borrowing under the public loan programme *reduces* total BC. Switching from a non-programme to a programme loan is worth 1.4 percentage point in total BC. However, the reduction is quite small in light of the difference between subsidised and non-subsidised loans, which is in the range of 20 percentage points (Section 4.2). This finding might be due to one or both of the two following reasons. A first possibility is that the programme application procedure as such implies so heavily increased TC that the overall subsidy effect is only barely positive. Alternatively, the programme might draw borrowers into the credit market who induce higher risk premia and more costly screening procedures, so that the subsidy effect is severely diluted.

Taking an automobile loan increases the effective interest rate by more than 4 percentage points on average. This variable also displays the highest *t*-value of all explanatories. However, its importance should not be overstated, since automobile loans are very rare events (Table 4). In any case, contrary to what one is used to in current EU-economies, automobile loans are relatively expensive in rural Poland.

The coefficients of the three dummies indicating the bank where the loan was taken reveal the following interesting insights. Conditional on all other variables, loans from the savings bank PKO are the least expensive, followed by loans from co-operative banks and the BGŻ (although the significance of the coefficient of the latter is just above the ten percent level). Compared to the fourth group consisting of various commercial banks, the discount in total BC is worth 1.6 (BGŻ), 1.8 (co-op), and 2.9 (PKO) percentage points, respectively. PKO hence offers the most attractive conditions, since otherwise observationally identical customers pay considerably less when taking a loan from this bank. The difference with the most commonly used co-operative banks is exactly one percentage point on average of all other loan characteristics. The less favourable result for the traditional agricultural banking sector is in accordance with the finding that it is inefficient compared to Western standards (KHITARISHVILI 2000). It substantiates the view that additional restructuring particularly of the governmentally controlled BGŻ might be necessary in order to become fully competitive with the price leader PKO. On the other hand, the (probably quite heterogeneous) group of commercial banks offers the least favourable terms for farmers, which is a marked difference to other countries (see e.g. CUEVAS and GRAHAM 1986).

The signs of the coefficients of farm and household characteristics generally support the above expectations. More land owned clearly reduces BC. Since the loan volume is considered separately, this is strong evidence for a collateral effect. Furthermore, younger farmers and farms with permanent book-keeping have lower BC, which is consistent with the results of the Probit model above. Participation in training courses and ownership of a PC does not significantly affect BC. The latter also applies for membership in a co-operative bank. Whereas

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<sup>9</sup> In the sample of loan contracts, the mean of the nominal interest rate for loans under the government programme is 7.72 percent for repayment periods of up to one year and 6.54 percent for loans with a longer repayment period. The difference is significant at one percent (according to a two-tailed *t*-test).

taking a loan from a co-op bank significantly affects BC, merely being a registered member has no effect. We also tested whether being a member of the co-op has an effect *conditional on* approaching the co-op bank for a loan. This was done by including an interaction term defined as loan from co-op times member of co-op. The coefficient of this term was not significantly different from zero, supporting the previous interpretation. In line with expectations, a job loss increases BC, whereas experiencing a harvest failure has no effect. Losing employment costs 2.3 percentage points of total BC. The coefficient of off-farm employment has an unexpected positive sign. The interpretation that off-farm employment indicates a liquidity cushion and thus lowers BC is thus rejected by the data. The positive sign could be due to the fact that households with off-farm employment are commonly part-time farmers with less experience and less emphasis on their farming business, which leads to higher BC of 1.4 percentage point on average.

We also tried to include variables that account for specific regions or proximity to urban centres in order to capture determinants of transport costs. However, these turned out to be uniformly insignificant, hence lending support to the notion that transport problems are not very relevant in rural Poland. This is also suggested by the results on the importance of transport costs in Table 1. Having in mind the rather decentralised structure of the country, this might be regarded as a plausible result. Similarly, we also explored the effects of including year dummies for the year of loan approval, to capture changes in the overall macroeconomic environment, in general credit availability, or in price relations including the inflation rate. The coefficients of these dummies also turned out to be insignificant.

The coefficient of the Inverse Mills Ratio is not significant. There is hence no observable statistical dependency between the borrowing decision and the determination of total BC. In other words, borrowing households do not display a tendency to face lower BC than non-borrowers. Selectivity bias can therefore be ignored in the second-stage regression.

Finally, we have a look at the variables' relative importance of contribution to the effective interest rate, as indicated by the *t*-values. If the exceptional value for automobile purchases is ignored, the most important loan attributes determining total BC are (in this order) the amount of land owned, off-farm employment of household members, loss of employment, taking a loan under the government programme, and the variables indicating the choice of the bank. Loan volume and membership in a co-op bank are no significant determinants of BC. Taking a programme loan significantly lowers BC, but the availability of collateral and certain socio-economic household characteristics have statistically an even more pronounced effect on BC. Quantitatively, the choice to take an automobile loan, experiencing a job loss, and the choice of the bank are the dummies with the highest effects on total BC.

## 7 SUMMARY AND CONCLUSIONS

The aim of this paper was to empirically investigate Polish farmers' access to credit. This was done in two steps: (a) by analysing the determinants of becoming a borrower, and (b) by identifying the relevant loan contract attributes which affect total BC, consisting of nominal interest rates plus additional TC. The first step included a Probit estimation of the probability of being a borrower. The second step used a hedonic regression analysis of total BC in percent of the loan volume. The analysis was based on specifically collected farm level data for 1997-1999.

The results consistently suggest two groups of borrower characteristics which are of central importance for access to credit by Polish farm households. First, the presence of devices to *screen and signal the quality of the borrower* in terms of available collateral and commercial

attitude of the farmer both makes borrowing more likely and reduces BC. In particular, the group of borrowers consists of farms with much land in own property which are run by young farmers with permanent book-keeping. These farms also tend to face low BC. This finding hence supports the theoretically stipulated relevance of asymmetric information on loan markets. Second, the *household dimension* of farming turned out to have a profound impact on borrowing outcomes and costs. Experiencing a loss of employment significantly increases the propensity to borrow, which underlines the function of credit as a liquidity insurance. At the same time, it increases BC by 2.3 percentage points on average, presumably due to the emergency character of the borrowing decision. This is consistent with the finding that households with members employed off-farm are less likely to borrow. It is assumed that off-farm jobs provide a liquidity cushion for the household which in turn obviates additional borrowing. On the other hand, the fact that household members work off-farm is not valued by the bank, since it increases total BC.

The widely held view that formal lenders tend to *discriminate against smaller farms* is hence supported by our analysis. Farms with fewer assets and managed by older farmers with a less commercial attitude, often on a part-time basis, are less likely to take loans and face higher BC.

This conclusion is valid under conditions of substantial *government intervention* on agricultural credit markets in Poland. All other contract attributes equal, taking a loan under the public lending programme *reduces total BC* by 1.4 percentage point on average. Compared to the nominal reduction of interest rates in the range of 17 to 25 percentage points, this is a small effect. In addition, *long-term loans are relatively less expensive* than short-term loans, which is probably due to a specific targeting of subsidies on investment loans. Fixed TC also become less relevant if the repayment period is longer.

The *choice of the bank* has a profound effect on total BC. Compared with the reference group consisting of various commercial banks, loans taken from the savings bank PKO are 2.9, from co-operative banks 1.8, and from the agricultural sector bank BGŻ 1.6 percentage point less expensive on average, respectively. This is net of the government subsidy. The governmentally protected and re-capitalised BGŻ hence still lags behind other banks in terms of price competitiveness. However, also the commercial banks as a group turn out to be less attractive than commonly assumed. An interesting finding is that being a registered member of a co-operative bank substantially increases the likelihood of becoming a borrower, but does not significantly lower total BC, also not if the member in fact approaches a co-operative bank. While social proximity to a co-operative bank seems to lower the threshold of borrowing as such, the procedures determining the actual borrowing terms apparently do not discriminate between members and non-members.

In comparison to the rural credit literature on developing countries, we find both similarities but also differences. In general, our analysis of the Polish case confirms the view that smaller and economically less powerful farmers are discriminated on governmentally influenced loan markets. However, two important caveats must be mentioned here. First, discrimination can at least partly be explained by the lower ability of smaller farms to overcome existing information asymmetries. The socio-economic attributes (such as off-farm employment, job losses) of borrowers who experience discrimination also suggest a higher risk exposure of these clients, which makes limited credit access a rational decision for the bank. Second, although government intervention does not eliminate these differences in loan access and BC, its overall effect – though small – is in accordance with the objective to foster credit extension. Nominal loan support is not completely eaten up or even turned to the opposite by additional bureaucracy.

A remarkable outcome of the analysis is the huge difference between nominal interest subsidies and the ultimate effect on BC, which is less than one tenth of the former. Where is this money lost? TC might be increased due to extra paperwork involved in programme application. In addition, the subsidy programme might have triggered a self-selection process among borrowers in such a way that the applicant pool becomes riskier, which in turn induces higher BC. Furthermore, as noted above, there are considerable differences depending on the bank the farmer approaches for loan application. It should be in the interest of all lenders to find out why certain banks can offer much more favourable terms to apparently observationally indistinguishable borrowers than others. Interestingly, the government has control over both the price-leader PKO and one of the laggards, the BGŻ.

Based on these considerations, a number of policy recommendations can be derived from the study. First, the government should check whether the small effect on total BC justifies the substantial resources spent on the entire programme. In particular, it is in question whether the lending procedures are sufficiently streamlined and whether the loans are effectively targeted. The structure of the rural banking sector, where the government is an important stakeholder, clearly affects farmers' credit access. Future policies aiming at a further restructuring or consolidation of the banking sector should take into account the relative performance of the competing banks. However, the privatisation of banks seems not generally recommendable, since private commercial banks are the most expensive lending source for agricultural credit. Other policy measures could address the demand side of the credit market. In general, younger farmers with a commercially oriented attitude have relatively better access to credit, which makes sense in an economic view. Promoting book-keeping and additional training of farmers could increase the group of successful borrowers in the future.

It seems not useful to generally interpret the recorded TC as an inefficiency of the loan market or a source of credit rationing, as compared with an unobserved first-best alternative. As argued above, there is no sound methodological foundation for this claim. But even if TC are measured pragmatically as the costs of using the existing credit delivery system, these costs need not imply an inefficiency. Asymmetric information is a fact of life, and banks as well as government agencies are well advised if they carefully screen borrowers and secure their lending risk. By taking into account the various quality attributes of loan contracts, we therefore based our analysis on a hedonic pricing approach to analyse the determinants of the effective interest rate of loans. In our opinion, the current study demonstrates that this is a framework capable of explaining existing price differentials on rural loan markets in Poland.

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