

# **The Impact of Globalization on Investment and Agricultural Restructuring: Evidence from Polish Agriculture**

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## **Introduction**

Agricultural credit and rural finance problems are important constraints on restructuring, investment, and thus on recovery and growth in transition countries. The problems are due to a combination of “normal” imperfections of rural credit and risk markets and specific transition problems such as macroeconomic instability, institutional reforms of the financial system, low profitability in agriculture, accumulated debts, high risk and uncertainty, and general contract enforcement problems (OECD, 1999, 2001).

Financing can come both from own resources and from (formal or informal) loans. Transition has constrained both sources of credit. Own financial resources are constrained because hyperinflation wiped out many savings in early transition, and low profitability and cash flow problems have complicated building up own resources during transition. Access to external credit has suffered from the same, and other, problems. Financial institutions are less likely to lend to enterprises with low profitability, outstanding debts, and cash flow problems. In addition, institutional problems such as ongoing reforms of the banking systems and the farms, a lack of credit history, high monitoring costs, etc. contribute to these problems (Swinnen and Gow, 1999).

While early discussions of the finance problems focused mostly on the institutional problems, later studies emphasize profitability and cash flow problems. For example, Pederson et al. (1997) emphasize the importance of profitability and cash flow problems in the perceived “excessive debt burden” of Russian farms. Another example is a 1998 Romanian survey, where farmers identify insufficient income as the key reason for their

loan application being rejected - 52% of the cases, much more than lack of collateral (18%) or outstanding debts (11%) (Davis et al. 1998).

An important factor in the cash flow and profitability problems are contract enforcement problems throughout the agri-food chain (Gow and Swinnen, 1998, 2001). A widespread effect is delayed payments for product deliveries. A survey of food companies in Central Europe identified payment delays as their constraint number one for growth (Gorton et al. 2000). Data from Slovakian farms show that payment delays are strongly correlated with profitability problems (Gow and Swinnen, 1998). A survey of Hungarian agricultural enterprises shows that for 61% of the farms contract breaches under the form of delayed payments are an important impediment to expanding profits (Cungu and Swinnen, 2002).

These finance problems have induced political pressure for governments to intervene. In many transition countries, governments have reacted by introducing credit subsidies and loan guarantee programs. The impact of these programs varies considerably (Swinnen and Gow, 1999). However, more importantly, progress in macro-economic and institutional reforms has reduced some of the institutional constraints and, especially in the more advanced transition countries, farm access to finance has gradually improved during transition. Yet, important imperfections and constraints remain.

Not only policy reforms but also private company restructuring has contributed to overcoming finance constraints. Agribusiness restructuring and investments up- and downstream from the farms have contributed to reducing farm finance constraints (Gow and Swinnen, 2001). Typically following a significant restructuring of the agribusiness companies, and often following foreign investment, companies have initiated programs to assist farms with accessing inputs and to provide supplier credit and other financial assistance.

There are several theories that try to explain the existence and use of supplier credit. Petersen and Rajan (1997) provide a comprehensive overview. First, business partners may have an advantage over traditional lenders in investigating each other's creditworthiness – through their interaction in the business relationship, as well as a better ability to monitor and force repayment of credit. Second, supplier credit may be offered as a means to price discriminate. Finally, supplier credit may reduce the transaction costs of paying bills. In a situation where a supplier of goods grants supplier credit to a customer, transaction costs can be lowered if the customer has the option to cumulate obligations and pay for instance only monthly instead of paying every time the goods are delivered.

While case studies suggest that the impact of these financial assistance programs has been significant in some cases (Gow et al., 2000), there is little evidence to measure their relative importance. Among the few existing exceptions are two influential studies by Johnson et al. (1999) and McMillan and Woodruff (1999), which analyse factors affecting contract enforcement and supplier credit in several transition countries.

In this paper we study agricultural investments and specifically the role of supplier credit in Polish agriculture, with emphasis on the dairy sector. Agriculture, predominantly on small farms, remains a dominant sector in Polish rural areas. Dairy plays an important role since many of the small farms have at least some milk production. The small scale of production, both at the farm level and at the processing level, makes that the dairy processing sector and the farms are in need of substantial restructuring and investments to upgrade technology in order to be competitive on the international market.

Polish agriculture is atypical in the transition world because it remained largely private throughout the communist era. Yet, the private farms were only allowed to operate within a centrally planned system with fixed prices and subsidies, much like in other communist countries. Moreover, strict constraints were imposed on the size of private

farms (Wilkin, 2000). As a result Polish agriculture was dominated by small private farms at the early 1990s. While this implied more inherent human capital for individual farming than in other countries, the rigid communist environment had seriously undermined entrepreneurship in farming and farmers had become used to rely on subsidized prices and inputs. Moreover, the private farms were generally too small for some basic investments requiring scale economies, such as on-farm cooling tanks in dairy production. Hence, in contrast to larger farms in neighbouring countries, milk quality was generally poor for these reasons. For example, in Slovakia large dairy farms that dominate the milk market, now and before, generally had basic investments, such as on-farm cooling equipment, and much higher milk quality standards than small Polish dairy farms. The initial conditions in Poland thus implied a major need for restructuring both in terms of farm size and in terms of upgrading of investments and quality standards etc.

In this paper, we combine insights from a series of in-depth interviews with domestic and foreign owned dairy processing companies as well as from a random survey of (potential) local suppliers (dairy farms) to these companies. We also interviewed some dairy equipment suppliers. In combination the collected information constitutes a unique dataset on the financing and investment by (small) suppliers in the Polish dairy sector.

The paper is organised as follows. First, we discuss the data. Next, we discuss qualitative evidence on investments and financing in the dairy sector and the role of private supplier credit. Finally, we present an econometric analysis to identify the determinants of access to supplier credit. The last section draws conclusions.

## **Data**

To study agricultural investments and specifically the role of supplier credit we collected data through a series of in-depth interviews with domestic and foreign owned

dairy processing companies and a random survey of local dairy farms which are potential suppliers to these companies.

### *Small suppliers*

The farm-level data collection focused on small suppliers and the data were collected in a 2001 survey of 290 dairy producing rural households in the Warminsko-Mazurskie region in the North-East of Poland. Warminsko-Mazurskie is an interesting region for this analysis because it is an important dairy region in Poland and because it has a mixture of large scale and small-scale farms – unlike some other regions in Poland. At the start of transition large-scale state farms (cooperatives were almost non-existent in Poland) farmed between 30% and 50% of agricultural land in the region.<sup>1</sup>

We interviewed 290 rural households who had at least had some dairy production in the past six years. This survey was performed in the fall of 2001 and included retrospective questions on changes that had occurred over the previous six years – more or less the period after the arrival of foreign investors in dairy companies in the region. The households were selected randomly in certain municipalities. As in the rest of Poland, domestic dairies still far outnumber foreign owned dairies. To ensure that the sample included a considerable number of farmers that had been in contact with foreign owned dairy companies and their policies, we over-represented municipalities in the vicinity to the three foreign owned dairies in the region (ICC - Paslek; Warmia Dairy; Kraft/Bel - Chorzele).<sup>2</sup>

Most of the so-called “farms” listed in the official Polish statistics as dairy farms are merely households producing for home consumption. They account for the vast majority of the 1 and 2 cow “farms” which make up 70% of the total number of dairy farms in Poland

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<sup>1</sup> Estimate on the basis of data on old voivodship classifications (Wies I Rolnictwo, 1999)

<sup>2</sup> Using a list of supplying farmers from the foreign owned dairy companies would create a selection bias since a list of current suppliers will exclude any farmers that have stopped supplying over the past years.

and 36% of dairy farms in Warminsko-Mazurski (table 1). Because of the focus of our analysis, i.e. to measure the extent and impact of supplier credit from the processing sector to suppliers, our survey concentrated on those households which delivered at least some milk to dairies at the start of the period covered by the survey (1995). As a consequence, households with 1 to 2 cows represent a smaller group in our survey sample: 3% in 1995 and 10% in 2000.

However, even with this selection focus, the vast majority of the farms in the sample are very small by (West or East) European standards. The majority of farms in the sample (57%) had less than 10 cows and 96% of the farms had less than 20 cows in 1995 (Table 1). The average size of dairy farms in the sample was 8.8 cows in 1995 and 10.5 cows in 2000.

#### *Dairy companies*

The structure of the dairy sector has changed over the past decade (see table 2). The total number of dairies has decreased by 22% between 1993 and 1999. This decrease was mainly caused by a decrease in the number of cooperatives, while the number of private companies has almost doubled. Yet, in 1999 dairy cooperatives still controlled 70% of the market. Twenty (40%) of the privately owned dairies had majority foreign investor ownership.

We selected six dairy companies for in-depth interviews with the management. The selection of the dairy companies was based on three criteria: FDI, ownership structure, and size. In terms of foreign investment, two of the selected companies are majority foreign owned, two have important links to foreign companies, and two are purely domestic. Four are medium size companies (50-70 million litres of milk) with one large (420 million litres) and one small (2.5 million litres). Three are cooperatives, two private, and one a joint venture of a cooperative and a private company. More specifically:

- MLEKPOL is one of the largest dairy cooperatives in Poland, 100% domestically owned, and currently receives milk from 14,000 dairy farmers. It produces a wide variety of products.
- MLECZARNIA is a small domestically owned private company. Its main production consists of yoghurts. The Polish yoghurt market is highly concentrated, with 70% of the market dominated by only 3 companies: Danone (French); Zott (German); Bakoma (Polish). Mleczarnia only sells its products to local shops.
- KURPIE is a middle sized domestic cooperative. In 2000, Hochland (a German/French investor) opened a processing plant next to Kurpie. 'Kurpie' is the sole supplier of cheese to Hochland, which produces secondary level processed cheeses.
- MAZOWSZE is also a middle sized Polish dairy cooperative. Since 1993 they started supplying pasteurised milk to the dairy multinational Kraft, who had bought the cooperative's debts from the bank and in this way acquired part of the cooperative's buildings. In 1998, the Kraft operation was taken over by Bel, a French company. Bel still buys milk from Mazowsze.
- ICC PASLEK was founded in 1994 when Land O' Lakes (USA) entered into a 50-50 joint venture with the local dairy cooperative in Paslek. Through consecutive capital injections, Land O' Lakes currently has a 70% ownership share in 'ICC Paslek'.
- WARMIA DAIRY started as a joint venture between Hoogwegt, a Dutch dairy company, and a local dairy cooperative in 1995. Since 1997, Hoogwegt has acquired 100% ownership.

In the next section we discuss investments and financing of these investments at the level of the small suppliers. Later on we develop an econometric model to assess the importance of supplier credit provided by the dairy companies and we determine the crucial factors underlying the access to supplier credit for the small suppliers.



### **Empirical evidence on investments and finance in the Polish dairy sector**

A recent World Bank study concluded that supplier credit is important in Polish agriculture, but that it is primarily targeted to larger farms. Very large companies, both input suppliers and downstream companies (including supermarkets), provide credit as part of a larger business relationship and this appears to be a very important source of credit for the largest 12% of farms in Poland (World Bank, 2001). These findings are consistent with studies from other countries which suggest that vertical contracting and support is mostly with larger farms as processing companies, especially foreign investors, prefer large suppliers to minimize transaction costs (Key and Runsten, 1999; Dolan and Humphrey, 2000).

However, our own findings, as we will explain next, suggest a different conclusion and show that supplier credit is not limited to large farms. Also for small farms supplier credit is very important, and most farms use a combination of bank loans and dairy financing, with the source of financing strongly determined by the type of investment.

#### *Supplier credit and financial assistance programs of dairy companies*

All the interviewed dairies have programs that assist their supplying farms. All have an input (esp. feed) supply program. The companies provide access to inputs, such as feed or seeds and fertilizers for on-farm feed production. Farmers purchase the inputs through company shops and the inputs are paid from the milk checks. One company also made a special feed mixer available at the dairy for its suppliers. Farmers were taught how to prepare high quality feed for their animals, and are allowed to use the equipment to prepare their own feed mix.

Five out of six companies assist farms in investing through credit programs. Investment assistance takes the form of leasing of equipment and cows, also with payments deducted from future payments for milk deliveries, as well as loans for buying new or second hand cooling and milking equipment. The only dairy which did not provide credit assistance programs or agricultural extension services to its suppliers was the small dairy 'Mleczarnia', probably because it did not have sufficient means (size).

Most of the companies also provide extension services to their suppliers. Technical assistance and support is provided through the company's extension agents. These specialists assist farmers with crop production, animal nutrition and health, animal genetics, breeding, selection and more recently they also assist farmers who want to expand their herds to find suitable cows for purchase both in Poland and in Western Europe. In some cases these extension programs had a large impact on delivered milk quality because major improvements resulted from introducing basic hygienic and sanitary rules when handling the milk on the farm.

Finally, five of the dairies provide bank loan guarantees for bank loans to farmers. Almost all bank loans for farm investments are with preferential interest rates (subsidized interest rates around 5% compared to commercial loans with interest rates often above 20%). In order to obtain such a loan, the farmer needs collateral. However, in many cases land or buildings are not accepted as a bank guarantee. Therefore, most interviewed dairies are providing an additional service to their suppliers by co-signing the bank loan. In this way the dairy puts in the bank loan guarantee and facilitates its farmers' access to bank credits and hence increases their investment possibilities.

#### *Farm investments and credit sources*

More than three quarters (76%) of all households in the survey made investments in the past ten years. Of those who invested, 58% used loans, and the rest (42%) used own resources to finance the investment (see table 3).

There are important differences in investment behaviour by farm size. Only half of the farms (52%) with 1-5 cows made investment compared to 78% of the 6-10 cow farms. Almost all (92%) of the farms with more than 10 cows made investments.

Also the source of investment finance differs by size category. Three quarters (74%) of the largest farms use loans to finance the investments, while only slightly more than half of the other farms use loans.

From those who obtain credit, 43% get credit from the dairy company, and 69% get a loan from a bank (including 10% who get loans from both sources). Of those who get loans from the banks the vast majority does so under so-called preferential, i.e. subsidized, interest rates. In fact, 60.4 % of the households had used preferential bank loans in the past, while only 11% had ever used bank loans on commercial terms. Moreover, preferential bank loans provide cheaper credit than the dairies: on the question why households who invested did not use loans from the dairy the most important reason (42%) was that they could get cheaper loans elsewhere.

In summary, small farms are less likely to invest than larger farms and if they do, they are more likely to do it using own resources. Almost all farms over 10 cows invest, and three quarters of them use loans, both from the banks and from dairies. Moreover, while the share of loans from the dairy company is stable across size classes, the farms with less than 5 cows are less likely to obtain a loan from the banks.

Further, table 4 suggests that the reason why loans come from dairies or from banks may have more to do with the *type* of investment than with the characteristics of the farm. Dairy loans are used almost uniquely for investments in enlarging and upgrading the

livestock herd (30%) and cooling tanks (56%). Together these account for 86% of all dairy loans. In contrast, only 29% of all bank loans are used for these types of investments. Bank loans are used more for investments in stalls (new, enlarging, or modernizing), land, and other investments.

Table 4 also illustrates that investments in land and in cooling tanks are financed relatively more from loans. This holds even more for investments in new cooling tanks (63%) than in second hand cooling tanks (44%).

Table 5 indicates that supplier credit, i.e. loans from the dairy, for investments are especially important for small to medium size loans. For investment loans up to 10,000 PLZ the dairy provides around one-third of the loans. For larger loans (10-50,000 PLZ), the share of dairy loans declines (22%). Loans over 50,000 PLZ come almost exclusively (93%) from the banks under preferential, i.e. subsidized, loans.

Table 5 confirms also how in general commercial bank loans are very limited in Polish agriculture as most of the bank loans have subsidized interest rates.

Note that the loans from dairies are only a partial indicator of the financial assistance offered by dairies. As explained above, part of their assistance is under the form of loan guarantees with the banks. Hence, part of the loans given by the banks are indirectly due to these loan guarantee programs of dairies. The importance of these is emphasized by answers to the question why households could not obtain preferential bank loans. Almost half (45%) of the households who could not obtain preferential bank loans identified lack of sufficient collateral as the main reason.

Table 6 provides further evidence that dairy financial assistance programs have been very important in stimulating on-farm investments. The share of farms that made recent investments is significantly larger in the group that delivers to dairies with assistance

programs (86.5% on average) compared to those that deliver to dairies without assistance programs (66.4 % on average).

Interestingly, the largest difference is for the input supply program. This suggests that the indirect investment impact of the programs may be even more important than the direct impact. The programs which assist farms in accessing inputs (mainly feed) are likely to affect investment indirectly by enhancing the profitability of the farm by lowering input costs, or reducing transaction costs in accessing inputs. As such they affect investments through improved profitability or through reduced transaction costs in input access.

The story is similar when we look at changes in herd size (table 7), although less farms have increased their herd size (53% on average with assistance, and 40.5% without) than have made investments in general (87% on average with, and 66% without). Yet there is a significant difference in herd size upgrading between farms delivering to dairies with and without assistance programs.

Finally, we found no significant difference in 2001 in most of the assistance programs provided by foreign owned companies and domestic dairies (see table 8). The only exception is loan guarantee programs that were more extensively provided by the foreign owned dairies. The latter may be due to the more sophisticated financing arrangements or financial provisions needed for the loan guarantee programs, compared to the other assistance programs.

Other evidence suggests that foreign investment has played a more important role early on in transition as an initiator of change and institutional innovation. For example, foreign companies have played a role by providing an example in quality improvement strategy. When Land O' Lakes invested in ICC Paslek in 1994, milk quality of its supplying farms – as everywhere in the region – was poor. From the start, ICC Paslek set out a clear strategy to increase the quality of delivered milk. One of their requirements was

that the cooperative – from which they lease collection stations – should install cooling tanks in these collection points. Furthermore, they invested in agricultural extension to raise farmers’ awareness of the importance of milk quality and to improve quality through basic hygienic rules for farmers handling the milk. Local dairy companies quickly learned about these changes in company policies implemented by foreign owners. Soon after Land O’ Lakes set up its quality improvement programs, local dairies started to copy these practices and this resulted in important spill-over effects. This process is reflected in the dramatic milk quality improvement throughout the region in the last five years. Our survey shows that the share of farms delivering extra class milk (the highest quality by EU standards) was significantly larger among farmers delivering to foreign owned dairies (58% versus 38% among farmers delivering to domestic dairies) in 1995. However, by 2000 this gap had almost disappeared: 83% versus 79% of farms delivering to foreign versus domestic dairies supplied extra class milk (Dries and Swinnen, 2004).

## **Econometric Evidence**

### *Model and Variables*

To complement our qualitative insights and to econometrically identify the determinants of supplier credit in the Polish dairy sector, we estimate a model, following the approach of McMillan and Woodruff (1999) and Johnson et al. (1999):

$$\text{TRADECREDIT}_i = \alpha_0 + \sum_{a=1}^k \alpha_a A_{i,a} + \sum_{b=1}^l \beta_b B_{i,b} + \sum_{c=1}^m \chi_c C_{i,c} + \xi_{i,t} \quad (1)$$

where TRADECREDIT is a dummy taking the value of 1 if investment  $i$  was financed with supplier credit from the dairy processing company and 0 otherwise;  $A$  is a vector of  $k$  variables identifying the relationship of the supplier to the dairy company;  $B$  is a vector of  $l$  variables related to the investment and previous investment behaviour of the household;  $C$  is a vector of  $m$  variables controlling for differences on the level of the farm and farm operator; and finally  $\xi_{i,t}$  is the error term.

Estimating equation (1) using standard maximum likelihood regression techniques will only take into account farms that actually made investments in the period that we consider. Such analysis, based on a sample of investing farms only, may be biased due to sample attrition. Therefore, we use a two-step Heckman model. First, a selection equation is estimated by maximum likelihood as an independent probit model to determine which farms have invested using information from the whole sample of suppliers. A vector of inverse Mills ratios (estimated expected error) can be generated from the parameter estimates. The source of financing is observed only when the selection equation equals 1. Then, for the suppliers that invest, the source of financing is regressed on the explanatory variables and the vector of inverse Mills ratios from the selection equation. Therefore, the second stage reruns the regression with the estimated expected error included as an extra explanatory variable, removing the part of the error term correlated with the explanatory variables and avoiding the bias.

Each observation in the econometric analysis identifies a possible investment in one of nine possible investment categories: building, enlarging or modernising a stall for cattle; buying new milking cows; buying a new or second-hand cooling tank for milk; buying or modernising a milk line; buying land; buying or modernising other agricultural equipment. The dependent variables in the two estimations are INVEST and TRADECREDIT, respectively. INVEST is a dummy that takes the value of 1 if an investment was made in a

certain asset between 1999 and 2001 and it takes the value of 0 if no investment was made in that asset in the specified period. TRADECREDIT is defined as a dummy taking the value of 1 if the investment was financed with supplier credit from the dairy processing company and 0 otherwise.

The first set of explanatory variables is related to the dairy company and the relationship between the supplier and the dairy.

DURATION is an indicator of the length of the relationship between the supplier and the dairy company, and measures the number of years that the household has been supplying to the dairy company to which it supplied at the time of the investment (or in case no investment was made in a certain asset, it measures the number of years the household has delivered to the dairy company to which it delivered in 1999). DURATION is expected to have a positive effect on the probability to receive supplier credit (McMillan and Woodruff, 1999 and Johnson et al., 1999). Fafchamps and Minten (1999) also point to the importance of existing relationships for access to supplier credit. A more stable relationship with the dairy company may also stimulate the milk producer to make investments so that we expect a positive impact of DURATION on INVEST.

FDI is a dummy, which takes the value of 1 if the household delivered its milk to a foreign owned dairy company at the time of the investment (or in 1999 in case no investment was made in a certain asset), and takes the value of 0 otherwise. The expected impact of FDI on the probability to receive supplier credit is positive because foreign owned processing companies have been shown to act as initiators of institutional innovations and hence are expected to be ahead of domestic dairy companies in offering credit assistance programs. Furthermore, domestic firms may be more financially constrained and consequently may not be able to offer credit to their suppliers. We also expect that farmers



supplying to foreign owned dairy companies might be more stimulated to invest. If so, we should find a positive impact of FDI on INVEST.

Tests show that there is significant positive correlation between DURATION and FDI (correlation coefficient: 28%), meaning that farms that deliver to a foreign owned company seem to have had a more stable business relationship with that dairy company than farms delivering to domestic dairies. Hence, the variables FDI and DURATION may not be independent. To test for the impact of possible multicollinearity problems in the estimation, we also ran restricted models (Models B and C) where DURATION and FDI are excluded, respectively.

The next group of explanatory variables in the analysis are characteristics of the investment and investment history of the household.

INVESTYPE is a dummy that takes the value of 1 if a dairy-specific investment was made, i.e. if the household invested in buying new cows, a new or second-hand cooling tank, or a milk line, and it takes the value 0 otherwise. We expect that dairy companies may be more inclined to offer credit for dairy related investments because these investments can be a sign of the commitment of the supplier to continue the production of milk. Hence, INVESTYPE is expected to have a positive impact on TRADECREDIT.

BANK is a dummy that takes the value of 1 if the household received a bank loan between 1991 and 1998 and is 0 otherwise. Bank loans are a strong sign of the creditworthiness of the supplier (Johnson et al., 1999; McMillan and Woodruff, 1999). Creditworthiness may have a positive impact on the probability of receiving supplier credit, i.e. dairy companies are more inclined to offer credit to more creditworthy suppliers. However, having access to bank loans may lower the need to apply for supplier credit from the dairy. Substitution of bank loans for supplier credit may result in a negative impact of

BANK on TRADECREDIT. In other words, there are two opposite forces at work and the overall effect of BANK is uncertain.

TOTALINVEST is a measure of the number of investments that were made by the household prior to 1999 and takes a value between 0 and 9, with 0 meaning that the household didn't invest between 1991 and 1999, 1 meaning the household invested in one asset etc. This indicator is important to explain the probability of investing. The more investments were made prior to 1999, the less likely the household will be to invest in the period since 1999. TOTALINVEST is expected to have a negative impact on INVEST.

Finally, we include variables related to the farm and the household.

FARMSIZE and FARMAGE are proxies for the size and the age of the farm respectively. FARMSIZE is measured by the number of cows on the farm in the year 1998. FARMAGE is measured as the number of years that the current farm operator has been in charge of the business. The impact of farm size and age on the probability to receive supplier credit is expected to be positive. On the one hand, size and age are correlated with reputation and as a consequence, larger and older farms may be offered more supplier credit because dairy companies will have more information about these firms. Similarly, larger farms will deliver more milk and also make more frequent deliveries. Again this provides the dairy company with more regular information about the larger firms. Finally, larger and older firms will have easier access to formal credit sources. On the one hand, this will act as a sign of creditworthiness for the processing company. On the other hand, the availability of other credit sources may lower the demand for supplier credit, depending on the terms under which credit is offered by alternative sources (Fafchamps, 1997; Peter and Rajan, 1997; Johnson et al., 1999; McMillan and Woodruff, 1999).

Finally, the impact of WAGE on INVEST is ambiguous. Extra sources of finance for investments can increase the likelihood of investing. Alternatively, off-farm

employment can act as a stepping-stone to leave the agricultural sector and households may be less inclined to invest in their farm operation if they are planning to leave the sector.

### *Regression Results*

Table 9 shows the estimation results. Columns A to C show that the coefficients of the variables related to the dairy company/sector are sensitive to variations in model specification. DURATION has no significant effect on TRADECREDIT. However, DURATION has a significantly negative effect on the likelihood to invest and the result is robust for different model specifications. This result is somewhat surprising as it would mean that households that have a less stable relationship with the dairy companies that they deliver to, are more likely to invest.

FDI has a positive and significant effect on INVEST, but not on TRADECREDIT. Farms supplying milk to foreign owned dairy companies are more likely to make investments. However, the result is not robust as the significance disappears in Model B where we have left out DURATION.

The most important factor determining access to supplier credit is investment related. INVESTTYPE has a positive and highly significant impact on TRADECREDIT. This means that supplier credit is granted mainly for dairy-specific investments. This finding is in line with our hypothesis that dairy companies are more inclined to support investments that show the motivation of the farmer to stay in dairy production. Or in other words, large sunk costs in dairy specific equipment serve as a signal of supplier reliability.

BANK does not have a significant impact on access to supplier credit. This could mean two things. First, obtaining a bank loan does not serve as a strong signal of creditworthiness for dairy companies. Second, farms that have access to bank loans may prefer to use these loans instead of supplier credit because, as we have indicated in the

previous section, preferential bank loans provide cheaper credit than the dairies.

FARMSIZE has a positive and significant effect (except in Model C) on the likelihood to receive supplier credit, while FARMAGE has a significantly negative coefficient. Larger farms benefit both from their reputation and from more frequent interactions with the dairy company (Fafchamps, 1997; Peter and Rajan, 1997; Johnson et al., 1999; McMillan and Woodruff, 1999). The negative coefficient for FARMAGE contradicts what is generally found in the literature and indicates that farms that have been taken over more recently are more likely to have made investments in more recent years. FARMSIZE and FARMAGE have a highly significant impact on INVEST. Again, larger farms and farms that have changed management more recently have on average invested more.

Finally, WAGE has a significantly negative impact on INVEST. This seems to support the idea that off-farm employment stimulates farm exits and as such lowers the incentives for making investments in the farm operation.

## **Conclusions**

Agricultural finance in Poland has been dramatically restructured since 1988. Before, credit was distributed through the fully state controlled banking system in accordance to a State central plan. It was the Polish government's instrument to implement its agricultural policy, mainly by extending subsidized loans to farmers and co-operatives, both state-owned and private.

Since then the banking sector and macro-economic policy has been reformed and liberalized. While this has caused hyperinflation, high interest rates, and many disruptions in the banking and rural finance system in early transition, these transitional features have

diminished, some faster than others. Inflation came down quickly to manageable levels. Interest rates have only gradually declined from over 40% to less than 10% annually.

The restructuring of the banking system and the provision of finance to enterprises has taken longer. The flow of finance to farms and rural enterprises, and recovery of farm investments, under the new market finance system seems to have taken off only in the second part of the 1990s.

While many studies report that there remain significant constraints in rural credit markets in Poland, our study suggests a more optimistic conclusion. A large part of Polish farms have made investments in the past years, and many of them with loans from either banks or processing companies. Only the smallest and least dynamic farms seem to still have significant problems accessing finance for investments. Virtually all farms with more than 10 cows (not exactly an enormous size) have made investments, and three quarters of them with loans.

Processing companies, and in particular dairy companies in our study, have played an important role in financial assistance, in particular for dairy-specific investments such as cooling tanks and livestock. In addition, they had an important indirect impact on farm activities and investments through their feed supply programs, affecting the overall profitability of the farms, and their loan guarantee programs, affecting the access to bank loans of the farms. These assistance programs have been targeted at both large and small farms.

In the perspective of the debate whether institutional problems or cash flow and profitability constraints are the most important constraint on farm finance in transition, supplier credit and other assistance programs seem to address both. They simultaneously improve the cash flow for the farmer by accessing external financial resources (i.e. company level financing) and by linking the programs with delivery schemes. The latter provide a

better cash flow and in many cases improved profitability by restoring marketing channels and on-time payments for dairy farms. At the same time the interlinking of credit and output markets through dairy companies, who are well-informed on the specific problems of the dairy market, provides for both enforcement and enhanced information in the credit contracts, and hence solves some of the most important institutional constraints in the finance market.

While foreign investment in processing companies seems to have played an important role in introducing institutional innovations in contracting and financial assistance programs for farms, by 2001 there was no significant difference in the programs and assistance provided by foreign companies and domestic companies. This suggests that FDI may be important as an initiator of change but that important spillover effects can occur and that major innovations can spread through the agri-food system based on domestic companies.

Finally, we believe that these insights have important lessons for other countries. The problems identified above as characterizing the dairy sector in early transition are similar as those in other transition countries, and even in some developing countries. While Poland had an advanced start in the sense that much of its farming was already in private hands at the start of transition, it faced more important constraints in other ways than its farming structure. In the dairy sector analysed here Poland faced major problems in the restructuring of this sector due to the very small scale of most Polish dairy farms and the low-level of initial milk quality and on-farm technology, even compared to its neighbours in Central Europe. Hence, the results of this paper are particularly important given these additional constraints. They may also provide lessons for other countries in the world, especially the poorest, where small-scale dairy production often plays a very important role in rural household income and farm production.

## References

- Cungu, A. and J. Swinnen, 2002, "Investment and Contracting in Transition: Evidence from Hungary" *LICOS Discussion Paper 127/2003*, LICOS-Centre for Transition Economics, Katholieke Universiteit Leuven.
- Davis, J.R., Gaburici, A., and P.G. Hare, 1998, "What's Wrong with Romanian Rural Finance? Understanding the Determinants of Private Farmers' Access to Credit?", *Centre for Economic Reform and Transformation Discussion Paper 98/08*, Department of Economics, Herriot-Watt University, Edinburgh.
- Dolan, C. and J. Humphrey, 2000, "Governance and Trade in Fresh Vegetables: The Impact of UK Supermarkets on the African Horticulture Industry", *Journal of Development Studies*, 37(2), pp. 147-176.
- Dries, L. and J.F.M. Swinnen, 2004, "Foreign Direct Investment, Vertical Integration, and Local Suppliers: Evidence from the Polish Dairy Sector", *World Development*, forthcoming.
- Fafchamps, M., 1997, "Trade Credit in Zimbabwean Manufacturing", *World Development*, 25(3), pp. 795-815.
- Fafchamps, M. and B. Minten, 1999, "Relationships and Traders in Madagascar", *Journal of Development Studies*, 35(6), pp. 1-35.
- Gorton, M., Buckwell, A., and S. Davidova, 2000, "Transfers and distortions along the CEEC food supply chains" in Tangermann, S., and M. Banse (eds.), *Central and Eastern European Agriculture in an Expanding European Union*, CAB International.
- Gow, H. and J. Swinnen, 1998, "Agribusiness Restructuring, Foreign Direct Investment, and Hold-Up Problems in Agricultural Transition", *European Review of Agricultural Economics*, 25(4), 331-350.
- Gow, H. and J.F.M. Swinnen, 2001, "Private Enforcement Capital and Contract Enforcement in Transition Countries" *American Journal of Agricultural Economics*, 83(3), 686-690.
- Gow, H., Streeter, D. and J. Swinnen, 2000, "How Private Contract Enforcement Mechanisms Can Succeed Where Public Institutions Fail: The Case of Juhosucor A.S." *Agricultural Economics*, 23(3), 253-265.
- Johnson, S., McMillan, J. and C. Woodruff, 1999, "Contract Enforcement in Transition", *EBRD Working Paper No. 45*, European Bank for Reconstruction and Development, London.
- Key, N. and D. Runsten, 1999, "Contract Farming, Smallholders, and Rural Development in Latin America: The Organization of Agroprocessing Firms and the Scale of Outgrower Production", *World Development*, 27(2), pp. 381-401.
- Majewski, E. and G. Dalton, 2000, *The Strategic Options for the Polish Agro-Food Sector in the Light of Economic Analyses*, FAPA, Warsaw.
- McMillan, J. and C. Woodruff, 1999, "Interfirm Relationships and Informal Credit in Vietnam", *The Quarterly Journal of Economics*, 114(4), pp. 1285-1320.

- OECD, 1999, *Agricultural Finance and Credit Infrastructure in Transition Economies – Proceedings of OECD Expert Meeting, Moscow, February 1999*, OECD Center for Co-operation with Non-Members, Paris.
- OECD, 2001, *Agricultural Finance and Credit Infrastructure in Transition Economies: Focus on South Eastern Europe – Proceedings of OECD Expert Meeting, Portoroz, Slovenia, May 2001*, OECD Center for Co-operation with Non-Members, Paris.
- Pederson, G. D., K. Brooks, O. Lektman, and Z. Lerman, 1997, “Russian Farm Finance Performance and Restructuring: A Debt or Profitability Problem?” World Bank Discussion Paper (Draft), The World Bank, Washington, DC.
- Petersen, M.A. and R.G. Rajan, 1997, “Trade Credit: Theories and Evidence”, *The Review of Financial Studies*, 10(3), pp. 661-691.
- Swinnen J. and H. Gow, 1999, “Agricultural Credit Problems and Policies during the Transition to a Market Economy in Central and Eastern Europe”, *Food Policy*, 21(1), pp. 21-47.
- Wies I Rolnictwo, 1999, Warsaw.
- Wilkin, J., 2000, “Rural Poland in the Process of Systemic Transformation. Attitudes of the Rural Population towards the Market, State and European Integration”, paper presented at the international conference on *European Rural Policy at the Crossroads*, Arkleton Centre for Rural Development Research, University of Aberdeen, Scotland.
- World Bank, 2001, *Poland. The Functioning of the Labor, Land and Financial Markets: Opportunities and Constraints for Farming Sector Restructuring*, The World Bank, Washington D.C.



**Table 1: Share of farms in our survey by size classes and processor**

	Number of cows per farm						total
	1	2	3-4	5-9	10-19	≥20	
sample 1995	1.7	1.4	12.8	40.7	39.3	4.1	100
sample 2000	5.1	5.9	10.3	26.9	35.9	12.4	100
W-M* 2000	22	13.8	19.1	29.1	13.1	2.9	100
no-FDI** 1995	1.3	1.3	12.1	40.1	42	3.2	100
no-FDI 2000	6.4	3.8	10.2	29.9	31.8	12.7	100
FDI 1995	0.8	0.8	12.7	42.1	38.1	5.6	100
FDI 2000	3.2	5.6	10.3	23.8	42.9	12.7	100

\* Warminsko-Mazurskie region

\*\* no-FDI is the group of farmers that were delivering to a domestic dairy company in 1995; FDI includes farmers delivering to a foreign owned dairy in 1995

**Table 2: Number of dairy companies with more than 50 employees in Poland, 1993-1999**

	1993	1994	1995	1996	1999	Change 93-99 (%)
Total	410	332	318	321	320	-22
Cooperatives	352	309	284	280	270	-24
Public companies	30	12	0	0	0	-100
Commercial law companies	28	11	34	41	50	+79

Source: Majewski and Dalton (2000)

**Table 3: Investments and Loans of Farm Households**

# cows	Invests (% of total)	Uses loan to invest (% of A)	Uses dairy loan (% of B)	Uses bank loan (% of B)	Uses dairy loan (% of A)	Uses bank loan (% of A)
	<i>A</i>	<i>B</i>	<i>C</i>	<i>D</i>	<i>E</i>	<i>F</i>
1-5	52	54	41	50	21	26
6-10	78	51	43	70	22	36
>10	92	74	43	75	31	54
<b>ALL</b>	<b>76</b>	<b>58</b>	<b>43</b>	<b>69</b>	<b>25</b>	<b>40</b>

**Table 4: Investments and loans by type (%)**

	Investments % by type	Total Loans % investm.	Dairy loans % by type	Bank loans % by type
Cows	14	37	14	9
Cooling tank	20	55	30	20
Stall	24	30	20	26
Land	9	46	11	14
Fence	11	2	0	0
Other	23	38	24	30
<b>TOTAL</b>	<b>100</b>	<b>36</b>	<b>100</b>	<b>100</b>

**Table 5: Credit source and loan size (for most important investment)**

Loan from (# respondents = 164)	dairy	bank, preferential	bank, commercial	other	Total
Loan amount (in PLZ)					
< 5000	29.6	57.7	8.5	4.2	100
5000-10000	34.9	55.8	7.0	2.3	100
10000-50000	22.2	69.4	8.3	0.0	100
> 50000	7.1	92.9	0.0	0.0	100

**Table 6: Share of farms delivering that have made recent investments by dairy type**

	With	Without
Credit program on-farm inv	84.0	67.7
Credit program cows	84.4	67.7
Input supply program	87.8	54.9
loan guarantee program	89.7	75.2
<b>Average</b>	<b>86.5</b>	<b>66.4</b>

**Table 7: Share of farms that increased their herd size since 1995 by dairy type**

	With	Without
Credit program on-farm inv	54.0	44.6
Credit program cows	55.1	41.5
Input supply program	52.5	37.3
loan guarantee program	51.7	38.5
Average	53.5	40.5

**Table 8: Foreign ownership and financial assistance programmes (% of farms delivering)**

	Foreign owned	Domestic
Credit program on-farm inv	71.6	71.4
Credit program cows	73.9	70.7
Input supply program	78.9	77.5
loan guarantee program	46.2	29.8
Average	71.6	71.4

**Table 9: Regression Results**

	Model A				Model B				Model C			
	INVEST		TRADECREDIT		INVEST		TRADECREDIT		INVEST		TRADECREDIT	
	Coeff.	z-value	Coeff.	z-value	Coeff.	z-value	Coeff.	z-value	Coeff.	z-value	Coeff.	z-value
Sector/Dairy company												
DURATION	-0.151	-5.23 ***	-0.005	-0.06	-	-	-	-	-0.127	-4.66 ***	0.031	0.39
FDI	0.214	2.66 ***	0.284	1.58	0.097	1.29	0.266	1.56	-	-	-	-
Investment characteristics												
INVESTYPE	-	-	0.665	3.50 ***	-	-	0.669	3.54 ***	-	-	0.664	3.52 ***
BANK	-	-	-0.127	-0.73	-	-	-0.077	-0.45	-	-	-0.164	-0.97
TOTALINVEST	0.027	0.78	-	-	0.036	1.06	-	-	0.024	0.71	-	-
Farm/HH characteristics												
FARMSIZE	0.022	4.58 ***	0.018	1.69 *	0.022	4.48 ***	0.018	1.66 *	0.021	4.46 ***	0.016	1.56
FARMAGE	-0.023	-5.09 ***	-0.018	-1.88 *	-0.020	-4.54 ***	-0.016	-1.58	-0.023	-5.11 ***	-0.019	-1.97 **
WAGE	-0.247	-2.39 **	-	-	-0.224	-2.17 **	-	-	-0.259	-2.53 **	-	-
Intercept	-0.854	-6.10 ***	-2.794	-7.47 ***	-1.351	-12.97 ***	-2.849	-9.81 ***	-0.829	-5.96 ***	-2.742	-7.50 ***
Log Likelihood	-724.35				-738.32				-728.19			
Number of observ	2529				2529				2529			
LR test of indep. equations (Rho=0):	Chi2=1.65 P>Chi2=0.20				Chi2=1.84 P>Chi2=0.17				Chi2=1.66 P>Chi2=0.20			

\* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%