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The Impact of Vertical Coordination on Supplier Access to Finance and Investments: Evidence from the Polish Dairy Sector

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Abstract

Agricultural credit and rural finance problems are important constraints on restructuring, investment, and thus on recovery and growth in transition countries. In this paper we study agricultural investments and financing in Polish agriculture. Our empirical evidence is based on a 2001 survey of both dairy producing rural households and dairy companies in the North-East of Poland. Dairy companies have played an important role in financial assistance, in particular for dairy-specific investments. In addition, they had an important indirect impact on farm activities and investments through feed supply, and loan guarantee programs.

Keywords: Poland, Dairy Sector, Vertical coordination, Investments

JEL classification: Q13; P33

The Impact of Vertical Coordination on Supplier Access to Finance and Investments: Evidence from the Polish Dairy Sector

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).

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 credit and other financial assistance (Dries and Swinnen, 2004).

There are several theories that try to explain the existence and use of processor loans to suppliers. 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, credit may be offered as a means to price discriminate. Finally, credit may reduce the transaction costs of paying bills. For instance, in a situation where a supplier of goods grants 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 trade credit¹ in several transition countries.

In this paper we study the role of vertical coordination, and more specifically financial assistance programs provided by processors to suppliers, on agricultural investments in the Polish 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

¹ McMillan and Woodruff (1999) focus mainly on trade credit, i.e. customer credit. In this case, the customer is allowed to pay his dues to the supplier after a certain period of time, which actually means that the customer is provided with credit for the duration of that period. In the current paper we focus on credit going in the opposite direction, i.e. credit given by the processor to its suppliers for on-farm investments. The supplier pays back the loan from the processor through the delivery of products, in this case milk.

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 subsidised 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. 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 financial assistance that is provided by the processor. Finally, we present an econometric analysis to identify the determinants of investments and the importance of assistance programs from the processor. The last section draws conclusions.

Data

To study agricultural investments and specifically the role of processor loans we collected data through a series of in-depth interviews with 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.²

We interviewed 290 rural households who had at least had some dairy production in the past six years. Specifically, only households were selected which produced and delivered milk to a dairy processor in 1995. The survey therefore also covers households that have stopped producing and/or delivering milk to a processor since 1995. By using this methodology we have tried to minimise sample selection bias due to exits.

The 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

² Estimate on the basis of data on old voivodship classifications (Wies I Rolnictwo, 1999)

investors in the dairy processing sector in the region.³ The households were selected randomly from different municipalities.

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 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 financial assistance from the processing sector to suppliers, our survey concentrated on those households that 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 (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’.

³ Dries and Swinnen (2004) found that foreign owned dairy companies played an important role in introducing assistance programs for suppliers. Domestic companies rapidly learned and copied the foreign investors’ strategies for improving the quality of milk supply (of which the assistance programs were an integral part) and as such created important positive spillover effects. The arrival of the foreign investors was therefore chosen as a starting point for the analysis.

- 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 financial assistance provided by the dairy companies for on-farm investments.

Empirical evidence on investments and finance in the Polish dairy sector

A recent World Bank study concluded that processor loans are 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 finance 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 benefiting 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 processor loans are not limited to large farms. Also for small farms financial assistance from the dairy companies 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.

Processor loans 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, 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.

On-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 (54%) with 1-5 cows made investments compared to 80% of the 6-10 cow farms. Almost all (89%) of the farms with more than 10 cows made investments.

Also the source of investment finance differs by size category. Almost three quarters (71%) 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.

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 for buying 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 processor loans 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. subsidised, 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 the loan guarantee program which is 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 impact of processor assistance to suppliers on investments in the Polish dairy sector, we estimate the following model:

$$\text{INVEST}_i = \beta_{0i} + \beta_{1i} \text{PLOAN}_i + \beta_2 \text{HH}_i + \beta_3 \text{PROGRAM}_i + \beta_4 \text{SIZEEFFECT}_i + \varepsilon_i \quad (1)$$

where INVEST is a dummy taking the value of 1 if a household has made an investment in any of nine possible assets⁴ since 1995 and it takes the value of 0 if no investment was made in the specified period; PLOAN is the variable that measures the impact of processor loans on suppliers' investments; HH and PROGRAM, are vectors of control variables; SIZEEFFECT is an interaction term that is included in certain specifications to control for possible size effects; and finally $\xi_{i,t}$ is the error term.

⁴ The nine investment categories are: 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 above relationship will be tested using a logit estimation model. Because the qualitative evidence in the previous section has shown that there may be an important correlation between the type of finance (own resources, bank loan, processor loan) and the type of investment (dairy-specific investment, general agricultural investment), we will re-estimate the model also with the dependent variable, INVEST, being a dummy that takes the value of 1 only if an investment was made in a dairy-specific asset.

The main hypotheses that we want to test is that financial assistance programs provided by the dairy companies to their suppliers have a positive impact on investments by small Polish dairy farmers. Therefore, PLOAN is a dummy that takes the value of one if a supplier is delivering to a dairy company that offers financial assistance, in other words, if the supplier has access to dairy processor loans. PLOAN takes the value of zero if the supplier does not have access to processor loans.

The first set of control variables (HH) is related to the farm and the farm 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 1995. 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).

WAGE is a dummy that takes the value of 1 if the household receives income from wage employment and it takes the value of zero otherwise. 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.

The second set of control variables (PROGRAM) is related to assistance programs other than processor loans that are available to suppliers. INPUTS is a dummy that takes the value of 1 if the supplier has access to an input supply program from the dairy company and that is zero in the other case. Likewise, GUARANTEE is a dummy that takes the value of 1 if the processor offers bank loan guarantees to its suppliers and that is zero otherwise. Apart from the direct impact on investments through processor loans, dairy input supply programs are likely to have an indirect impact on suppliers' investments by enhancing the profitability of the farm by lowering input costs, or reducing transaction costs in accessing inputs. Furthermore, bank loan guarantee programs have a potentially important indirect impact on investments by facilitating access to external finance (bank loans).

Finally, we include an interaction variable to control for possible size bias in access to these assistance programs. LOAN*SIZE is an interaction term between assistance programs (a combination of PLOAN, INPUTS and GUARANTEE) and FARMSIZE. LOAN*SIZE is included to assess the claim by several studies (Key and Runsten, 1999; Dolan and Humphrey, 2000) that vertical contracting and support is mostly benefiting larger farms as processing companies prefer large suppliers to minimize transaction costs.

Regression results

Table 9 and 10 show the estimation result for the different specifications of the dependent variable (all investments or dairy-specific investments only), respectively. The columns of tables 9 and 10 show the estimation results for different specifications of the model. This enables us to get a clear picture of the effect of the gradual introduction of control variables. As the results of the models with different specifications of the dependent variable are fairly similar, we will focus the discussion of the regression output on the results presented in Table 9.

PLOAN has a positive and highly significant effect on investments by dairy farms. This result is robust to the introduction of farm and household specific characteristics. However, the PLOAN coefficient loses its strength once we include the other variables that measure processor assistance programs (INPUTS and GUARANTEE). This result shows that there is a high correlation between the different assistance programs that are offered by a dairy company and moreover, that farmers that have access to financial assistance from the dairy, are more likely to have access to other programs as well. However, even with the introduction of all three types of assistance programs in the model, INPUTS has a positive and highly significant impact on investments. This result shows that not only the direct impact of processor loans may be important to stimulate on-farm investments but furthermore there seems to be an important indirect effect through the improved access to inputs for suppliers. Access to inputs has a positive impact on farm profitability and as such, facilitates investments using own resources, as well as through access to finance from external sources.

Furthermore, the positive PLOAN result is not robust to the introduction of the interaction term that controls for size effects. The PLOAN coefficient becomes negative (although not significant), while LOAN*SIZE is positive and highly significant. This result combined with the significantly positive coefficient of FARMSIZE shows that larger farms are more likely to make investments and that this likelihood increases even more for larger farms with access to processor assistance programs. The coefficient for INPUTS remains positive even after the introduction of the size effect, showing that having access to inputs has a positive impact on the likelihood to invest, independent of the size of the farm.

To conclude, we briefly discuss what we can learn from the results of the other coefficients in the model. FARMSIZE has a positive and significant effect on the likelihood to invest (and this effect is robust to all model specifications), 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 with 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. Finally, WAGE has no significant impact on INVEST, having access to off-farm sources of income does not seem to affect investments at the farm level.

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 with accessing finance for investments. Virtually all farms with more than 10 cows 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, processor loans 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 enforcement and enhanced information in the credit contracts for both, 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.

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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 | 54 | 56 | 41 | 50 | 21 | 26 |
| 6-10 | 80 | 51 | 43 | 70 | 22 | 36 |
| >10 | 89 | 71 | 43 | 75 | 31 | 54 |
| ALL | 76 | 58 | 43 | 69 | 25 | 40 |

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 |
| Cool 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 |
| TOTAL | 100 | 36 | 100 | 100 |

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 programs | Without programs |
|----------------------------|------------------|---------------------|
| 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 |
| Average | 86.5 | 66.4 |

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 – INVEST includes all investments

| | Model A | | Model B | | Model C | | Model D | | Model E | |
|-----------------------|---------|-----------|---------|-----------|---------|-----------|---------|-----------|---------|-----------|
| | Coeff. | z-value | Coeff. | z-value | Coeff. | z-value | Coeff. | z-value | Coeff. | z-value |
| PLOAN | 1.064 | (4.08)*** | 0.759 | (2.58)*** | 0.214 | (0.62) | -0.162 | (0.39) | -0.273 | (0.63) |
| LOAN*SIZE | - | - | - | - | - | - | 0.181 | (3.51)*** | 0.131 | (2.09)** |
| Farm & household | | | | | | | | | | |
| FARMSIZE | - | - | 0.185 | (4.36)*** | 0.177 | (4.15)*** | 0.085 | (1.85)* | 0.107 | (2.15)** |
| FARMAGE | - | - | -0.067 | (4.24)*** | -0.067 | (4.26)*** | -0.072 | (4.39)*** | -0.072 | (4.36)*** |
| WAGE | - | - | 0.027 | (0.07) | 0.066 | (0.18) | 0.121 | (0.32) | 0.100 | (0.27) |
| Programs | | | | | | | | | | |
| INPUTS | - | - | - | - | 1.074 | (3.02)*** | | | 0.585 | (1.34) |
| GUARANTEE | - | - | - | - | 0.231 | (0.52) | | | 0.306 | (0.68) |
| Constant | 0.204 | (1.10) | 0.063 | (0.14) | -0.187 | (0.41) | 0.451 | (0.99) | 0.232 | (0.47) |
| Pseudo-R ² | 0.05 | | 0.18 | | 0.21 | | 0.21 | | 0.22 | |
| Observations | 291 | | 280 | | 280 | | 280 | | 280 | |

Table 10: Regression Results – INVEST includes dairy-specific investments only

| | Model A | | Model B | | Model C | | Model D | | Model E | |
|-----------------------|---------|-----------|---------|-----------|---------|-----------|---------|-----------|---------|-----------|
| | Coeff. | z-value | Coeff. | z-value | Coeff. | z-value | Coeff. | z-value | Coeff. | z-value |
| PLOAN | 1.078 | (4.33)*** | 0.809 | (2.94)*** | 0.337 | (1.06) | 0.333 | (0.93) | 0.196 | (0.53) |
| LOAN*SIZE | - | - | - | - | - | - | 0.090 | (2.09)** | 0.040 | (0.75) |
| Farm & household | | | | | | | | | | |
| FARMSIZE | - | - | 0.170 | (4.83)*** | 0.168 | (4.75)*** | 0.111 | (2.55)** | 0.142 | (2.93)*** |
| FARMAGE | - | - | -0.048 | (3.24)*** | -0.049 | (3.26)*** | -0.050 | (3.32)*** | -0.050 | (3.29)*** |
| WAGE | - | - | -0.251 | (0.72) | -0.240 | (0.68) | -0.209 | (0.60) | -0.233 | (0.66) |
| Programs | | | | | | | | | | |
| INPUTS | - | - | - | - | 0.741 | (2.23)** | - | - | 0.567 | (1.40) |
| GUARANTEE | - | - | - | - | 0.563 | (1.53) | - | - | 0.592 | (1.59) |
| Constant | -0.668 | (3.43)*** | -1.123 | (2.66)*** | -1.396 | (3.16)*** | -0.895 | (2.07)** | -1.233 | (2.52)** |
| Pseudo-R ² | 0.05 | | 0.16 | | 0.19 | | 0.17 | | 0.19 | |
| Observations | 291 | | 280 | | 280 | | 280 | | 280 | |

