Risk and De-Collectivisation in the Czech Republic

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ABSTRACT

The replacement of wage-labour farms by family farms in Central and Eastern Europe during the transformation has been more limited than was originally expected. In this paper a formal framework is developed in order to analyse the behaviour of family farms and socialist-style farms in the presence of risk, given the typical post-socialist environment. Management incentives, ownership structure, lump-sum transfers and consumption choices are shown to have the potential to limit the size of family farms relative to socialist-style farms. The hypotheses are tested with survey data collected by the author in the Czech Republic.

Key words: transition, agriculture, structural change, risk, survey data

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Introduction

A salient feature of the transformation process in post-socialist Central and Eastern European countries has been the relative persistence of socialist-era production structures in the agricultural sectors. Socialist farms were either collective or state farms. Both farm types were corporate organisations in the sense that there was a separation between farm ownership, control over the production process and implementation of production tasks. These were wage-labour farms, as distinct from the Western-type family farm.

In the agricultural economics literature preceding the liberal revolutions of 1989-1991 in the region, socialist agriculture had long been identified as cost-inefficient due to incentive problems inherent in the governance structure of wage-labour farms[1]. Also in analyses of the transformation process it was observed of socialist-style farm structures that "the evident weakness of this organisational form provides the argument for full scale privatisation" (IMF *et al.*, 1991:157-158). In consequence, privatisation was to go beyond a change in formal ownership titles and to include structural change in agriculture. "(P)rivatization in … agriculture mainly concerns the breaking up of large units…" and "restructuring of large-scale farms (is) in line with the new ownership patterns and the principles of a market-based economy" (World Bank, 1995:2; Csaki and Lerman, 1994:560).

Thus, de-collectivisation was commonly defined as the formation of individually operated (for short: 'individual') farms from the land and property of formerly collective and state farms (henceforth referred to as 'traditional' farms). This process was expected to follow reforms in property rights over farmland and other farm assets. These would create new, or newly effective, individual (rather than collective or state) owners, who could be expected to search for the most efficient and profitable use of their assets. Given the inefficiency of wage-labour farming, owners could be expected to use their assets in (or rent them to) individual farms, rather than leave them in traditional farm structures (Machness and Schnytzer, 1993:162; Mathijs, 1998:33). This expectation was one motivation for the farm and land reform programmes implemented throughout Central and Eastern Europe in the early 1990's. "Consequently, .. the new law [on land and farm structure reforms, DJB] may bring about a reversal in farm structure…" (Davidova on Bulgaria in Swinnen, 1994:42). “The present reform induces rapid structural change based on the new economic fundamentals: private property, free initiative and liberalised prices. … The basic process of agriculture’s transition toward a market economy is the establishment of private ownership and of the family peasant farm.” (Gavrilescu on Romania in Swinnen, 1994:178). Also more recently, Lerman (2000:10) regards ‘individualization of former socialist agriculture as a valid goal, … since individual farms are the dominant organizational forms in market economies.”

However, as early as 1994 it could be noted that “already now it is clear that the process of farm restructuring … is taking a course which appears to be different from the original expectations of many Western European observers. … It is remarkable that farm enterprises … choose to reorganise as whole entities, without dismantling the collective structure” (Csaki and Lerman, 1994: 566, 573). In many Central and Eastern European countries, a considerable, and sometimes a majority share of agricultural land was, and still is worked by farming structures other than individual farms. This share is 92 % in Slovakia, 76 % in the Czech Republic, 72 % in Hungary, 48 % in Bulgaria, 37 % in Estonia, 35 % in Romania, 33 % in Lithuania, and 5 % in Latvia and Albania (Swinnen and Mathijs, 1999:24; Cungu and Swinnen, 1999:607)[2].

In the empirical literature, various reasons for the limited emergence of individual farms in most Central and Eastern European countries have been suggested, including malfunctioning factor markets and credit markets, asset incompatibility, land fragmentation, contract enforcement, and human capital problems (e.g. Sarris et al., 1999; Cungu and Swinnen, 1999; Mathijs et al, 1999). The aim of this paper is to suggest another possible reason for the limited emergence of individual farming in the region. It is based on the differences between individual and traditional farms with regard to the ownership-management-implementation division of labour, the relation between profit and income, the range of economic activities, and the interaction between household and farm business. The impact of these features on farm expansion in the presence of uncertainty is analysed theoretically and assessed with survey data.

Data

The data used in this paper were collected in two mail surveys conducted in the Czech Republic in 1998-1999 by the author. These surveys were developed on the basis of interview work and a pilot study in Moravia (the eastern part of the Czech Republic) during 1997 and 1998[3]. One survey was addressed to operators of individual farms, who were members of the Czech Association of Private Farmers (SSZ). The distribution of SSZ members over the administrative districts in the country was taken to be an approximation of the distribution of all Czech individual farmers[4]. The survey among management of traditional farms in the Czech Republic was conducted in co-operation with regional representatives of the Czech-Moravian Union of Agricultural Co-operatives (representing co-operative farms and farm companies with limited liability and joint-stock structure. These are the successor organisations to socialist-era collective farms. Data on 193 individual farms and 69 traditional farms were collected[5]. In table 1 the distribution over farm types and mean areas of farms in the sample are compared to official data.

Table 1: Czech Survey Statistics and Official Figures

organisation type	survey (1998)			official figures (1998)		
	sample size		mean size (ha)	number		Mean size (ha)
	count	%		Count	%	
farming companies	29	11	1,512	2,208	2	677
co-operatives	40	15	1,707	1,256	1	1,411
individual farmers*	193	74	79	92,845	95	-
of which** - professional	70	27	101	32,365	33	26
- other indiv.	123	47	40	60,480	62	-
other farms***	-	-	-	958	1	46
all farms	262	100	494	97,267	100	-

* In the official information this figure comprises of agricultural primary production businesses with the legal form of 'physical person' (*podniky fyzickych osob*) in the 'Register of Economic Subjects' – probably including many gardeners and hobby farmers. In the survey information these are members of the Czech Association of Private Farmers.

** 'Professional' individual farms in the survey are farms where the owner both derives more than three-quarters of income from the farm and devotes over 40 hours weekly to farming. In the official data this categpory comprises of farmers registered in the 'Agricultural Register' as producing food (i.e. for the market).

*** In this category fall the remaining state-owned farms and farms for educational purposes.

Sources: survey findings, MACR (1999:TA 2.1).

The figures show that the sample provides no proportional representation of farm types. There are two reasons. Given the modest size of the sample dictated by time and budget constraints, a statistically accurate representation of all Czech farms was not possible to start with, and propotional representation not an issue. Moreover, with proportional representation the sample would have been saturated with 'other' (very small) individual farms and contain very few traditional farms, ruling out the between-types analyses that are the aim of this research.

Moreover, the survey depicts a group of farms that is large compared to those in the official figures. For the individual farms, this originates in the inclusion of many extremely small structures (often actually gardens and hobby farms) in the official data, as compared to the SSZ membership survey sample frame (selected with the aim to collect data on ‘genuine’ farms). For traditional farms, the presence of a specialised ‘farms economist’ within the management team of larger farms probably increased the response rate in that group.

Since detailed technical and financial information could not be collected in the survey, an additional source of information was used. This was the 1996 round of the regular surveys conducted by the Czech Research Institute for Agricultural Economics (VUZE) at. This data set consists of 238 individual and 172 traditional farms and includes information on area, product mix, labour and wages, costs and revenues, production efficiency and regional location. The data nformation from the VUZE data set and the two survey data sets were combined taking scale, scope and location into account[6].

The Argument

Four observations are pertinent to the present account of why the individual farming sector remains limited. First, this is not so much due to the number of farms as to their size. In the case of the Czech Republic, in 1998 there were, according to the 'Register of Economic Subjects', 92,845 agricultural businesses with the legal form of 'physical person' (*podniky fyzickych osob*), i.e. individual farmers. But the number of individual farmers also registered (this time in the 'Agricultural Register') as producing food (i.e. for the market) was only 32,365 (MACR, 1999: TA2.1/03;TA2.1/04). Of these 32,365 farmers there is area information for 22,971: over half (12,208) worked less than ten hectares and only 6 % (1,425) used over a hundred hectares. Between them they worked 24 % of agricultural land, with an average area of 26 hectares (MACR, 1999:TA 2.1/05).

The bulk of the remaining land was occupied by 3,464 traditional farms (2,208 farm companies and 1,256 co-operative farms). Of the 2,251 traditional farms for which area information is given, all worked over a hundred hectares, except for a minority of 232 farms, or about 10 %. The average area was 677 hectares for farm companies and 1,411 hectares for co-operative farms (MACR, 1999:TA2.1/03; TA2.1/04).

The same pattern can be observed in most other Central and Eastern European countries (see Sarris *et al.*, 1999:309 for figures). Individual farms have been established in abundance, but most remain of marginal size relative to traditional farms. Explaining why individual farms stay small and traditional farms stay large is an important step towards explaining present agricultural sector structures in Central and Eastern Europe.

A second observation is that Central and Eastern European agricultural markets have been characterised by risk in the sense of variability of farm gate output prices[7]. An illustration is presented in table 2, where price developments during the transformation in the Czech Republic and the European Union are compared. Especially in the years up to 1995, price fluctuations were large.

Table 2: Food Price Indices in the European Union-12 and the Czech(o-Slovak) Republic

Year	price index (1990=100)			
	EU-12		Czecho-Slovak/Czech Republic	
	crops	Livestock	crops	livestock
1990	100	100	100	100
1991	107	99	58	48
1992	98	102	109	104
1993	99	102	112	97
1994	100	100	119	126
1995	109	98	142	162
1996	109	99	159	168
1997	106	102	154	167
1998	110	98	160	177

Note: Indices are based on real aggregate farm gate prices.

Sources: OECD (1995) MACR (1998, 1999), EBRD (1999), Eurostat (1994, 1999) and author's calculations.

Third, the defining differences between the individual and traditional farms is governance structure, particularly in relation to the use of wage labour. In addition, there are type-related differences in several other farm features such as revenue composition and consumption behaviour. In connection to that, the fourth observation underlying the present account is that economic theory suggests a link between, on the one hand, such farm features and, on the other, agents' perception of risk. Moreover, theory also poses a relation between (perceived) risk levels and the level of output – or farm size.

Combining these observations, a partial explanation for the limited emergence of individual farms may be that, given price risk, farm features affect the risk perception of decision makers directly and output levels of their farms indirectly. This may cause traditional governance structures to dominate individual-farm structures in terms of use of factors of production and in terms of output[8].

Analysis

The implications of individual and traditional farming under risk are best studied by a formalisation of the production and income characteristics of the alternative farm types. Given a utility function U(K,L) of the farm owner, a variable indirect utility function which is the dual of U can be defined as V(p,y), where p denotes a stochastic output price, y is income, K denotes the quantity of capital and L other factors of production used (an aggregate of land and labour). Abstracting from saving, utility depends on income and there is risk aversion so that $V_y > 0$, $V_{yy} < 0$[9]. Consider the case of an individual-farm owner-operator. Expected total income depends directly on profit and can be defined as

$$E(y) = E(pF) - c(L,K) + B \qquad (1)$$
$$F = F(L,K)$$
$$c = p^K K + p^L L$$

where E is the expectation operator, B denotes non-stochastic, non-agricultural income, and c and F are the cost and production function, their values depending on prices and quantities of inputs[10]. This basic model can be used and adapted to show that there is a set of mechanisms that causes risk to have a larger impact on individual farm strategy than is the case in traditional farms.

Investment under Uncertainty

As Sandmo (1971) has shown, investment under price uncertainty is smaller than under price certainty. Importantly for the present argument, a central parameter in the proof of that result is the sensitivity of the utility from income to price risk, or $COV(V_{y,}p)$. In the proof, we compare a farm producing under uncertainty with an income function as in (1) to a farm producing under certainty with E(y) = y. Sandmo's thesis can be demonstrated by equating the first-order conditions with regard to capital investment of both, assuming certain input prices and yields. Denoting the uncertainty case by a superscript asterisk, this gives:

$$E(V_y\, y_K)^* = V_y\, y_K = 0$$
$$E(V_y\, y_K)^* = E(V_y(pF_K - p^K)^* + COV(V_{y,}(pF_K - p^K) = V_y(pF_K - p^K) = 0$$
$$COV(V_{y,}p) < 0 \qquad \Leftrightarrow \qquad (pF_K - p^K)^* > (pF_K - p^K) = 0$$

In words, under uncertainty and risk aversion marginal revenues exceed marginal costs, which must imply that investment and output levels are lower than in the certainty alternative, proportional to the value of $COV(V_{y,}p)$, which is a measure for the sensitivity of the utility of income to price risk.

A conventional focus in the production-under-uncertainty literature is on risk aversion of the decision maker, which is most often assumed an innate personal characteristic. In the present study the stress is on the sensitivity of utility from income to price risk, which is controlled both by risk aversion and by the extent to which price fluctuations translate into income fluctuations. The main analytical aim of this section is to show how, in the Central and Eastern European context, this extent may depend on farm features. Specifically, we will now analyse management incentives; ownership structures; lump-sum transfers; and production-consumption links.

Management

Traditional farms are corporate farms, i.e. there is a functional separation between labour, management, and ownership. Typically, owners of a part of the corporate farm[11] have delegated most of the formulation of farm strategy to the farm management, who face a different incentive structure from the individual farm owner. Farm management income (denoted I) is not equal to farm profit y, but usually for the larger part is a fixed wage (w) and, possibly, a share (1-t) of farm profit (which is normalised to 1). The simplest management income function that incorporates the above features is

$$I = w + (1-t)y \qquad (2)$$

$$\text{s.t.} \quad y = 1$$

$$0 < t, I, w < 1$$

Under uncertainty, the optimisation problem for the individual-farm owner or traditional-farm manager is to set input levels such that $E(V_y y_K) = 0$ and $E(V_I I_K) = 0$, respectively. Assuming that $V_y = V_I$, *i.e.* that a wealth difference between the traditional farm manager and individual farm operator owner does not affect the utility of income, the above implies

Proposition 1: Employment of farm managers with a (partly) fixed wage results in lower investment in risk exposed production than in the certainty alternative, but higher than would be the case on owner-operated farms.

<u>Proof</u>: see Appendix

Since, as we have seen, under-investment is proportional to -COV($V_{.}$,p), traditional farms under-invest less than individual farms, the difference being proportional to the fixed share of manager salaries t and inversely proportional to the marginal productivity of capital F_K., traditional-farm over-investment (as compared to the individual owner-operated farm) will occur[12]. *Ceteris paribus*[13], the lower sensitivity of decision makers' incomes to price risk in traditional farms as compared to individual farms is one possible reason for the fact that traditional farming continues to be *large-scale* farming, relative to professional[14] individual farms.

Multiple or Single Ownership

Not only is the corporate governance structure characterised by the employment of management, also the farm is owned by many owners rather than one single owner. The farm feature of interest here is the number of owners relative to farm size. The individual farm is characterised as a small single-owner farm, the traditional farm as a large multiple-owner farm. Compare a single-owner farm of type s producing output F to a multi-owner farm of type m producing output kF. Expected farm income is E(y) as in (1) for owners of farm type s, but the n owners of type m have an income defined by

$$Ey_m = (k/n)y_m + B_m \qquad (3)$$

s.t.

$k,n > 1$

Selecting output levels such that profit is optimised means $E(V_y y_F) = 0$ for both types[15]. It follows that

Proposition 2: Multiple ownership causes traditional farm owners' investment to increase with decreasing ratio of farm output level (k) to farm fragmentation (n).

Proof: see Appendix

The important observation is that, typically, $k/n < 1$ if Czech traditional farms in the sample are compared to professional individual farms (n=64 and n=184, respectively). The average output level of traditional and individual farms was 330 and 1,5 million Czech Crowns in 1998. The average traditional farms had a management of 5 persons and a labour force of 95 workers, of whom 80 were also members/shareholders of the farm. There were on average 245 non-worker members or shareholders. The number of individual farms with wage labour was negligible, with on average only 0.2 workers (though 0.7 part-time workers).

These figures show that, on average, per-member revenue levels differ by a factor 223 (330/1.5) from those of professional single owners, while there are on average 325 shareholders or members in traditional farms. Thus $k/n < 1$ holds on average and most often; of 64 traditional farms, only 4 had average revenues per member exceeding the professional individual-farm average level of revenues.

Three qualifications to this finding must be made. First, we have here considered all formal members as effective members, i.e. as individuals with some influence on farm decision making. In fact, only a minority is actually involved in the process. However, the above conclusion stands also when taking into account that probably only the larger stakeholders exert influence in traditional farms[16].

Second, even these 'genuine' members may not be as eager to pursue a particular farm strategy, such as risk reduction as single farm operators are. In the analysis it was assumed that for each agent, only his or her claim to revenue level controls his or her willingness to exert efforts in (co-)deciding on farm strategy, particularly risk reduction. In fact, various conditions other than ownership stakes weaken this incentive for traditional farm members compared to single farm owners, such as shared leverage over farm strategy with other members and, notably, with management. Also, the notion of choice between engaging in farm decision making and abstaining from it is applicable to multiple farm owners, but not as easily to single farm owner/operators. Being an individual farmer implies decision making and to abstain from it is to quit farming, with all that it implies for income security, housing, and lifestyle, incurring high costs. Moreover, some costs do not exist for individual farmers (e.g. deliberation) and others are sunk costs (e.g. for travel between home and farm and for collecting information). While the above analysis emphasised the lower pay-off in farm revenues to decision making for traditional farm members, they actually also face higher costs of decision making.

Lump-sum Transfers

There are four types of lump sum transfers (denoted B in equation (1)) to those who decide over agricultural production levels (owners or managers) in traditional farms. These include subsidies; credit (both coming in periodical liquidity and postponement of 'bad' debts repayment); revenues from non-agricultural production (which, if non-stochastic, can be treated as lump-sum transfers); and non-agricultural wage income or allowances for owners. All of these are more important in traditional than in individual farms, and especially in professional individual farms (see e.g. Csaki *et al.* on access to credit and subsidies; Davis and Pearce (2000) on non-agricultural activities; and note that most owners of traditional farms have full-time non-farm jobs).

Such lump-sum transfers decrease sensitivity to agricultural price risk, possibly in two ways. First and most obviously, in the notation introduced in (1), the cash or liquidity inflow from non-agricultural production (if non-stochastic), credit and subsidy all increase B and y. Since a larger share of y is now constituted by stable revenues (B), fluctuations in agricultural prices (p) and revenues (pF) result in smaller fluctuations in income (y) than if B would be smaller or absent;

hence $COV(V_{y,}p)$ decreases in B. Second, if utility from income $E(V_y)$, and hence risk aversion both decrease in income ($V_{yy} < 0$), increasing that income by adding or increasing its lump-sum part (B) decreases income sensitivity to risk in general, including agricultural price risk[17]. This leads to

Proposition 3: Stable revenues from non-agricultural production, better access to credit and subsidies, and owners' non-farm income are all lump-sum transfers that decrease sensitivity to risk and hence increase output level in traditional farms (t) relative to individual farms (i).
Proof: see Appendix

On-Farm Consumption

The above arguments all focused on exposure to price risk. As such, they were applicable to traditional and to professional individual farmers who actually market most of their produce, but not directly to the multitude of very small farms that are worked part-time or in addition to a non-farm income or allowance. It is likely that on these small farms a significant share of farm output is consumed by the producer, used as gifts, or bartered. In contrast to larger individual and to traditional farms, the fact that household consumption (or non-monetised exchange) and farm production are interwoven becomes relatively important for production decisions in this, the overwhelming majority of individual farms. Food is now both an input and an output. The behaviour of such producers differs in many aspects from that of market-oriented farmers *(De Janvry et al*., 1991).

As Roe and Graham-Tomasi (1986), Finkelshtain and Chalfant (1991) and Barrett (1996) have shown for family agriculture, home-consumption has the effect of income risk reduction. In terms of the notation introduced in (1), consumption is equivalent to replacing part of money income from production with a stable, lump-sum in-kind transfer to it, valued at stable input costs. The difference with lump-sum transfers analysed above is that it is now endogenous, i.e. depending on output level.

Risk reduction through own consumption of produce occurs more often on individual than on traditional farms, for several reasons. First, the option to choose between buying and producing presumes one decision unit (the family) weighing both options. This is so in individual, but not in traditional farms, where decision making and co-ordination is more costly. Second, on wage-labour farms there are considerable transaction costs of allocating produce to workers. Third, the risk reduction effect is also less important for traditional farms since a considerable share of output must be consumed in order to effect appreciable risk reduction. Per-person consumption is limited physically, and given large output volumes (in relation to the number of potential consumers in the farm) there may simply not be enough consumers to effect a risk reduction that justifies the costs.

The relevance of these observations to the present topic is that increasing farm size reduces the effect of risk reduction from home consumption. Small individual farmers may therefore be caught in a 'size trap': they face an increase in income risk when they expand.

Finally, very small individual farms are often worked in addition to a wage or allowance income that is large in comparison to professional individual farmers. Thus there is a relatively stable, non-agricultural lump-sum transfer to farming, with the effect of decreasing sensitivity to agricultural price risk, as shown above. Also this risk management advantage would decrease upon farm expansion, since total labour time is fixed on the owner-operated farm.

The implication of this analysis is that both large, multi-owner, manager-operated farms, and very small subsistence-type farms can diminish price risk for their owners' incomes, while larger commercial family farms cannot. In this respect, transitional agricultural may be said to have a three-tier rather than the commonly posed dual structure (as in Sarris *et al.*, 1999).

In the formal analysis, we consider here only the effect of own consumption (we have already seen that lump-sum transfers decrease sensitivity to risk in proposition 3). Compare a professional to an 'other', i.e. small/hobby individual farm, denoting them by superscripts a and b, respectively. Farms of type b market a share α of their output F and consume the rest. Consumed output is valued at certain price p_v, and equals a stable lump-sum transfer of quantity $B = p_v(1-\alpha)F$ to uncertain money income $E(y)^b$. If α is positive, some own consumption is preferred over marketing all of the output. Expected marginal utility from selling - equal to E(p) - is then apparently smaller than marginal utility from consumption (which is p_v). Thus, income for type a is defined as in (1), while income for type b is defined by

$$E(y)^b = \alpha E(pF) - c(L,K) + p_v(1-\alpha)F \qquad (4)$$

where

$0< \alpha < 1$

$E(p) < p_v$

The implication of the above is

Proposition 4: Consumption of own production and larger non-farm income shares in small individual farms decrease the sensitivity of income to risk and discourage farm expansion of smaller compared to larger individual farms.
Proof: see Appendix

Does Diversification Matter?
We will finally consider one possible objection to the relevance of the above arguments. These all aim to show that operators of traditional farms are less sensitive to price risk, and therefore less prone to reduce output levels in response to it. Alternatively, it could be argued that traditional farms indeed *are* less risk exposed because of their larger diversification. In that case, a smaller output-reducing response to risk would result from the farm output mix reducing *actual* risk exposure, not governance structures affection risk *perception*.

This objection seems relevant in the setting of farming in the transformation. Traditional farms indeed have a higher level of diversification, both within the area of agricultural production and with respect to activities outside the agricultural domain. Both features are inherited from the socialist era and, although reduced, continue to characterise traditional farms.

However, in the sample, diversification within agriculture was not important for risk reduction during transformation, for two reasons. First, in 1998 the actual variety in output mix was not much larger in traditional than in individual farms. In order to analyse the differences over farm types, diversification in the sample was measured by construction of a diversification index D. By definition, this should increase in the number of products and decrease in the share in revenues of a particular product. D can then be defined as

$$D = 1 - \sum_{i=1}^{n} (r_i/r)^2$$

s.t.

$0 < r_i ,r < 1$

where r_i is the share of revenues from product or product group i in total revenues r from n products or product groups. If D = 0, there is no diversification (i.e. one product only), while D gets closer to 1 as more products are added or as the shares of products become more equal. Obviously, the value of D depends on the method of disaggregating production. If D is calculated including separately each of 10 main products in Czech agriculture (n=10), its value is .74 for professional and .78 for other individual farms in the sample, but .84 for traditional farms, with negligible differences between corporate and co-operative farms. If crops and livestock are aggregated (n=2), individual farms score .45 while traditional farms score .50, now with small differences within both groups of farm modes. So, while traditional farms are indeed more diversified, the difference is not large.

The second and most important reason why diversification was not very relevant is that, for diversification to effect risk reduction, there must be negative covariances between prices or price series of product or product groups. Unfortunately, prices of the 10 main agricultural products moved largely synchronously during transformation (see table 3 in the next section). None of the bivariate Pearson correlation coefficients relating to all possible pairs of the 1989-1998 time series is negative and significant.

Whilst the effect of within-agriculture diversification on risk exposure of traditional relative to individual farms is thus limited in the period considered, this is not true for the other type of diversification, i.e. in activities *outside* the agricultural domain. These can be composed of relatively stable (i.e. non-stochastic) or of fluctuating revenues. In the first case, it is equivalent to a lump-sum transfer (of non-agriculturaling profit) to the agricultural activities of that farm, which decreases sensitivity to agricultural risk (proposition 3).

If revenues from other activities do fluctuate over time, they typically have the effect that agricultural risk is partly diversified away, given the non-synchronous price movements of food and other products. This decreases the covariance of total (agricultural and other) income and agricultural prices. Thus, at constant levels of risk from agricultural production, total income risk decreases, and so does the sensitivity to the agricultural risk component of it, $COV(V_{y,}p)$. In sum, what diversification differences existed tended to decrease not actual risk from agricultural production, but rather income risk for traditional-farm decision makers – a distinction that also characterised the preceding arguments.

Assessment

Testing the Theory

While the mechanisms proposed above are varied, they all have one implication, namely with regard to the sensitivity to risk of farm operators. Traditional farms operators (be they managers or owners) are assumed to be less sensitive to risk than are individual farm operators, while within the last group operators of professional farms are expected to have a larger sensitivity of income to risk than do ‘other’ individual farmers, if their output is valued at market prices.

The test is therefore: do traditional farm managers indeed exhibit a smaller reaction to changes in price risk than operators of professional individual farms, and will these in turn show a larger reaction than other individual farmers? Ideally, one would like to track that reaction – which is an adjustment of output mix- for a sample of farms over a number of years, regressing, for instance, price risk for a given crop on hectares planted to that crop (as in Chavas and Holt, 1990 and Chavas et al., 1983). This 'best practice' approach relies on a sufficiently long time series for meaningful results, and the short transformation period as well as the nature of the survey renders it unfeasible. Instead, in the present study it was considered that a lower sensitivity to risk implies, *ceteris paribus*, a higher exposure to risk. Hence a measure for risk exposure that could be applied to the survey data was constructed.

Measuring Risk Exposure

Price risk is commonly defined as the difference between expected and realised output prices (*e.g.* Tronstad and McNeill, 1989:631). Expected prices were defined as the average over the preceding 3 years plus a trend (cf. Lin, 1977; Hurt and Garcia, 1982; Chavas and Holt, 1990). Deviations of actual from expected price developments were calculated for each of the 10 main products in Czech agriculture. The per-product squared deviations in per cent terms[18] were combined, in each farm observed in the survey, through a weighed summation. Since output price risk is studied, the weighting factor, for each of the 10 products, was the ratio of product revenues to total revenues. This share was calculated on the basis of production volumes as reported by the respondents. Thus the measure for price risk exposure R_y for each farm was:

$$R_y = \sum_{i=1}^{i=10} (rev_{i,y} \cdot risk_{i,y})$$

where

$$rev_{i,y} = r_{i,y} / \sum_{j=1}^{j=10} (r_{j,y})$$

$$risk_{i,y} = \{ p_{i,y} - \sum_{n=1}^{n=3} (\theta_n \cdot p_{i,y-n} / p_{i,y}) - \sum_{m=1}^{m=2} (\theta_m \, p_{i,y-m} / p_{i,y-m-1}) \}^2$$

where

$rev_{i,y}$ = share in revenues of product i in year y

$r_{i,j,y}$ = revenues of product i,j in year y

$risk_{i,y}$ = price risk from product i in year y

$p_{i,y}$ = real indexed price of product i in year y

i = 1,2,..,j,..10

$\theta_n, \theta_m > 0; \Sigma\theta_n, \Sigma\theta_m = 1$

In words, expected prices are defined as the average over the last three years plus the trend. For a given year y and a given product i, the per cent deviations of actual from expected prices are squared. This squared deviation is *product risk* $risk_{i,y}$. The 10 product risk measures are combined, for each farm, in a weighted summation on the basis of product shares in total revenues, to yield *price risk exposure* R_y. Different combinations of values for the weights θ_n and θ_m - which determine how important previous prices and price trends are in current price expectations - were tried. The findings reported below did not qualitatively change in the various combinations. Therefore the unweighted average ($\theta_1 = \theta_2 = \theta_3 =.33$) was used. Note that R_y is designed so as to capture not just general market risk (which is $risk_{i,y}$) but output price risk as experienced in each single farm; it increases with increasing variability in output prices, and does so more for products which are more important for total revenues in a farm.

We have noted that risk exposure and risk sensitivity vary inversely, *ceteris paribus*. The most important of the ‘other’ factors is history, especially for traditional farms. The production structure in some year in the transformation, which controls the value of R_y, may be an inheritance from the socialist era rather than (or in addition to) a variable at the discretion of managers and owners during transition. Traditional managers’ risk sensitivity and the risk reduction they effected during transition might have been as large as (or larger than) individual farmers’, while this need not show in traditional-farm production structures, and thus risk exposure in the year y.

This possibility could be taken into account, since respondents reported their production structures both in 1992 (the first effective post-reform year) and at the moment of surveying in 1998. This allows for a static comparison in risk exposure between the two years of observation (although it cannot reflect the response to risk experienced in the intervening years). The survey data allow for the calculation of risk exposure measures for each of the four types of farms in the survey. Two remarks on the farm subgroups are in order here. First, as noted, ‘professional’ individual farmers were defined as those who derived more than 75 per cent of money income from farming and worked at least 40 hours weekly in their farm. This information was, however, available for 1998 only, and it is not valid to assume that 1998 professional farmers were already so in 1992. Consequently R_{1992} is calculated without differentiation between professional and other individual farmers. This measure is therefore likely an over-estimation of individual farmers' risk exposure, both because of the own consumption and the larger non-farm income of 'other' individual farmers.

Second, during the transformation, and especially after 1995, differences within the traditional-farming sector increased as profitable activities tended to become concentrated in the corporate rather than the co-operative farming mode. Often debts and activities with adverse prospects were left in the co-operative farm, while valuable assets and profitable farm activities were transferred to a (newly established) corporate farm. The co-operatives, although formally surviving, effectively became 'empty shells' (see Csaki et al., 1999:31,36,28). For our present analysis the important implication is that it were increasingly the corporate rather than the co-operative farms that reflected the strategy preferences of traditional farm operators. The decisions on changes in the product mix of co-operative farms were increasingly controlled by considerations other than the profit motive assumed in the analysis. Since the proportion of such 'skeleton' farms in the sample is naturally unknown, all co-operative farms will be included in the analysis, but their characteristics in 1998 can be expected to differ significantly from those of corporate farms. In particular, given the relation between profitability and risk, they can be expected to operate less risk exposed.

Calculations and Findings

In table 4 the development of prices of the 10 food products in the Czech Republic is shown, as well as the risk attached to production of each product, if quantified by the suggested formula.

Table 3: Prices and Price Risk in Czech(o-Slovak) Agriculture, 1989-1998

product	indexed real farm gate product prices[1]										$risk_{1992}$	$Risk_{1998}$
	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998		
wheat	100	94	55	121	130	135	126	182	198	178	.308	.046
barley[2]	100	90	43	98	111	121	121	153	158	162	.265	.001
rape seed[4]	100	93	41	104	99	116	118	128	141	147	.315	.001
oats	100	90	38	74	84	90	85	115	119	123	.094	.004
rye	100	86	43	72	81	85	81	119	128	117	.064	.042
potatoes[3]	100	121	70	132	96	129	305	197	115	186	.137	.078
sugar beet	100	109	73	143	123	120	148	162	148	136	.219	.017
milk[5]	100	90	39	92	87	97	103	111	116	124	.250	.002
beef and veal	100	90	41	79	74	104	118	118	115	126	.120	.007
pork	100	90	50	109	96	132	202	209	207	207	.292	.000

Notes:(1) Original prices are farm gate prices in current Czech Crown per ton for all products.

(2) Figures for oats and barley in 1997 and 1998 refer to ‘inputs in husbandry from agriculture' , as presented in table ta8.1/02 in MACR (1998).

(3) Potato figures refer to consumption potatoes.

(4) Rape seed figures refer to oilseeds figures in 1994-1998.

(5) A complete series of milk prices was available for class II milk only in 1994-1998. Price developments of class I milk deviate only a few percents from class II.

Sources: OECD (1995), MACR (1998, 1999) EBRD (1999)

It is shown that risk values differ considerably over products, in both years. Also the risk values were much lower in 1998 than in 1992, reflecting the greater price stability in 1998. With regard to the relevance of the arguments here presented, there are two observations. First, since these arguments relate to marginal adjustments in response to market prices, they are likely to have become more relevant during the transformation, since farm strategy became increasingly controlled by relative prices on established markets rather than by fundamental institutional change related to the creation of markets. At the same time, since the arguments rely on the presence of price risk, increasing price stability during transformation implies a more modest role for these arguments in explaining farm size.

Turning from the relevance to the truth of this account, table 4 shows the values of risk exposure measures in 1992 and 1998 for both governance types and for their subgroups, if applicable.

Table 4: Individual Farms Showed Less Risk Exposure Than Traditional Farms

farm type	value $risk_{1992}$	n	value $risk_{1998}$	n
traditional	.232	64	.018	64
of which: corporate	.225	25	.018	26
co-operative	.237	39	.017	38
individual	.185	184	.012	174
of which: professional	n.a.	n.a.	.012	116
other	n.a.	n.a.	.013	58

n.a. = not applicable

Sources: Table 3 sources, survey findings and author's calculations

The findings can be summarised as follows. First, both the 1992 and the 1998 risk exposure scores of traditional farms were, on average, higher than those of individual farms, the difference being statistically significant in both cases ($\alpha < 1$ %). Thus the two main implications of the theoretical arguments are corroborated: traditional farms are both larger and operate more risk exposed than individual farms. Second, the difference had increased in 1998 compared to 1992 in relative terms, from about a 3:4 to a 2:3 ratio. This means that, although larger risk exposure in traditional farms may still have been inherited from the socialist era, it was not reduced relative to individual farm exposure levels by their managers or owners during transformation. This is in line with their assumed smaller sensitivity to price risk. It appears justifiable to attribute the persistent difference to decision makers' preferences rather than only to history.

Third, within the groups of the two farm types, professional individual farms produced less risk exposed in 1998 than other individual farms; and co-operative farms produced less risk exposed in 1998 than corporate farms. Although both observations are in line with expectations, the differences are too small to be statistically significant. This, in turn, implies that the overestimation of risk exposure in 1992 due to the inclusion of non-professional farmers in 1992 is probably not large.

Finally, product selection is likely controlled by location as well as governance type. Therefore risk exposure measures were also calculated after aggregation of farms by types and then by agricultural areas, as defined by the Czech Agricultural Research Institute. Three of them are named after the crop that is best produced there (sugar beet, potatoes and maize); the other comprises of the mountainous or sub-mountainous regions. The survey sample includes observations from 3 regions.

The results are given in table 5, which shows that in each of the three regions higher risk exposure of traditional farms is observable, in both 1992 and 1998. However, due to the smaller number of observations per region, none of the differences is statistically significant. If all farms in one region are aggregated, average risk exposure differs statistically significantly only between region 3 and 4 in 1992 and between regions 2 and 3 in 1998 ($\alpha < 3$ %). Differences between regions are smaller, in relative terms, than those between farm types in 1998, but not in 1992. These figures indeed suggest the presence of regional effects, which however do not affect the main results.

Table 5: Regional Differences in Risk Exposure by Farm Type

farm type	risk exposure measure and # respondents *(n)* in region…						
	1992				1998		
	2	3	4		2	3	4
professional individual	.206	.174	.183		.016	.011	.008
N	38	64	19		37	59	19
other individual	.187	.191	.156		.015	.013	.010
N	22	26	14		21	26	11
Corporate	.237	.224	.218		.015	.017	.024
N	11	6	9		11	.6	9
co-operative	.248	.235	.219		.017	.018	.017
N	20	3	15		20	3	15
All	.101	.332	.033		.016	.012	.014
N	91	99	57		89	94	54

Region codes: 1 = ‘maize’, 2 = ‘sugar beet’, 3 = ’potato’, 4= ‘(sub-)mountainous’.

Sources: Table 4 sources, survey findings and author’s calculations

Discussion

Methodological Limitations

In this paper an explanation for limited individual farming was offered that is theoretically tractable and consistent as well as empirically verifiable and, in fact, corroborated by the available data. The conclusion that risk may imply a larger incentive to under-produce for individual than for traditional farms stands, but should be qualified in several respects. Attention should again be drawn here to the fact that we have measured risk exposure not risk response; that the risk exposure measure is debatable; and that the assessment was done in a snapshot approach for 2 years only. All three features of the empirical work are imposed by the data, and constitute considerable methodological shortcomings compared to what has been done in studies on similar subjects in developed market economies (e.g. Chavas and Holt, 1990).

As to the theory, attention should be drawn not so much to shortcomings in what was presented as to possible extensions that could qualify the hypotheses. First, we have empirically lumped together several theoretically distinct mechanisms with one joint implication. It would be important to know which of these is the more relevant one. Although some indication of this has been given, there is room for more detailed empirical work here. Second, risk perception is just one factor controlling output mix and levels. We have tried to account for regional factors and history, but also this could be more satisfactorily done in a regression approach. In addition, factors such as price level (rather than variability) and institutional factors affecting farm sizes (i.e. endogenous farm growth in the start-up phase; changes in support programs) would merit separate attention, both theoretically and empirically.

An overall assessment of this contribution is that it proposes an explanation not hitherto considered explicitly in the literature, which is theoretically defendable and is not rejected in this first, admittedly crude, empirical test. Since its conclusion should be accepted with caution, there is a case for further research of the issue, also because of the possible implications for the effectiveness of agricultural policies.

Risk Exposure and Survival

This account, while attempting to explain one phenomenon, also begs several new questions. In particular it would be strange that, while selection of production strategies that are systematically and excessively risk exposed is presumable punished in developed, competitive markets, traditional farms (having an innate tendency to overexposure to price risk) are apparently not weeded out by competition in favour of the supposedly more prudent individual farmers. Several answers to this puzzle may present themselves to readers familiar with the Central and Eastern European setting (see on the following e.g. Swinnen et al, 1997; Csaki et al, 1999; Sarris et al, 1999).

In the transitional economies, bankruptcy is often legally complex and rather easy to postpone. The underdevelopment of the legal and, especially, judicial system delays the exit of weaker firms. A related observation is that payment discipline is often still weak. Firms frequently operate in a situation of interdependencies inherited from the former economic system, which shows in such diverse phenomena as 'bad' debts to banks or excessive regional specialisation in agribusiness. Also legal enforcement of contract obligations is problematic and time consuming. Moreover the allocation of subsidies and credit is not generally towards the most efficient recipient. But often based on other rationales, e.g. networks and relations (Grabherr and Stark, 1997).

These circumstances hinder the development of normalised payment practices and financial transparency in farms. A crucial point is that they often advantage traditional farms, which are long integrated in the economic system, more so than individual farms. Differential access to credit and subsidies, more 'bad' loans and more lenient payment practices may compensate the financial loss of overly risk exposed production. The tendency of traditional farms to stay large and operate risk exposed may thus be perpetuated.

Changes in Individual Farm Structures

Most individual farms in the sample were established in 1990 (27), 1991 (66), 1992 (48), or 1993 (24). In the 182 responses to the relevant survey question, only six farms were started after 1993. Official data show the same pattern. Between 1989 and 1994 the number of people working in what is classified as 'natural person businesses' (*podniky fyzických osob*) – comprising of mainly individual farms and practically equal to the number of businesses- rose from 2,000 to 31,217, and the share in total agricultural land (TAL) increased from virtually nothing to 22 %. In the second stage of the agricultural transformation, the number of people rose slightly to 34,000 in 1995, then fell back to 33,000 in 1996 and stabilised at 32,000 and 32,500 in 1997 and 1998; the share in TAL increased only slightly from 22 to 23 % (MACR 1999: TA2.2/03)[19].

So, while the main conclusion of this paper is that an increase in risk discourages individual farming, the sample information as well as official sources show that there was a surge in the establishment of individual farms in 1991-1995 (which were high-risk years) and hardly start-ups afterwards (when risk had decreased considerably). At first sight, this could be interpreted as a contradiction. But that would be to ignore two issues.

First, there are a number of differences between decisions on starting a farm and those on expanding or contracting farm size, notably with regard to reversibility of the decision and to welfare (income and lifestyle) consequences of it. The latter type of decisions is likely controlled by more, and more complex, factors than the former. This analysis refers exclusively to the relation between risk and farm size for existing farms.

A second point is that this is an explanation assuming established markets and attributing explanatory power to marginal changes in farm size in relation to marginal change in price variability. As such the explanation is better suited to account for the period after the institutional changes in the agricultural sector, i.e. the 'second stage of the transformation' starting in 1994-1995. In earlier years, such adaptation processes were plausibly of marginal importance relative to many other factors. These include the more extensive individual-farm credit and subsidies support programs, and the initial enthusiasm for individual farming, no doubt partly based on ignorance regarding requirements for and hardships of family farming. In this period traditional farms were also forced to implement de-collectivisation procedures which implied decreasing in size. It appears that after 1994/1995, de-collectivisation in the above sense was over and there was a roughly stable number of individual and traditional farms. If we analyse developments in this period (rather than compare 1989-1994 to 1995-1995), the development of individual farming does not seem to contradict the present account, as the following figures show.

The increase in the number of individual farms between 1995 and 1998 (from 21,156 to 22,971) was larger than the increase in their share in Total Agricultural Land (22 to 24 %), and the average size of individual farms in 1995-1998 indeed decreased from 34 to 26 hectares (MACR, 1999:TA2.1/04). The increase in numbers was almost entirely due to an increase in the number of the very small, or 'non-professional' individual farms. The number of farms working between 10 and 50 hectares increased marginally from 7,985 to 8,102. Those in the 51-100 hectares size class decreased in number from 1,345 to 1,236. The number of farms working over a hundred hectares rose slightly from 1,379 to 1,425. But the number of farms smaller than 10 hectares increased considerably, from 10, 447 to 12,208. These data are in line with the theoretical suggestion that price risk discourages farm expansion: it was the number rather than the size of farms that increased.

Policy Implications

The policy implications of the suggested explanation differ from some and support other prescriptions implied by the conventional structure-efficiency approach (posing that, in competitive markets, ultimately those farm structures will emerge that are most efficient). In particular, it would follow that market liberalisation (in the sense of a decrease of price regulation) is not always a means to promote efficiency in post-socialist dual (in fact: three-tier) agricultural sectors. Market liberalisation proper would also imply a truly level playing field, *i.e.* the removal of differences in access to credit and subsidies, of 'bad' loans, and of payment arrears; and moreover the creation of a legal environment in which contracts are externally enforceable without excessive costs. If such a package of policies is applied, systematic overexposure to risk will bring its own punishment and the present argument becomes irrelevant. It is here that the analysis supports the consensus that reforms must be comprehensive, not partial in order to be effective.

Implementation of such 'deep' reforms is unfortunately a complex and long-term job, and a mere decrease in price regulation is often seen as a desirable first step towards a more efficient allocation of resources. Yet in the absence of competition and effective institutions, mere price liberalisation may have perverse effects. Price liberalisation causes price risk to increase and introduces incentives for traditional farms to increase in size relative to individual farms. If traditional farms are less efficient than individual farms (see e.g. Mathijs et al, 1999), this implies, on average, an incentive to decrease efficiency on a sectoral level.

An efficient allocation of resources over alternative governance structures through the market mechanism therefore not only requires the removal of market distortions (such as price regulation and differential access to credit and subsidies). It also demands either price stability or removal of the advantages of established farms in transacting and financing production which are typically implicit in the institutional environment. Given the impracticability of attaining either goal fully in the short to medium term (still apart from the desirability of perfect price stability), restructuring polices should have the dual focus of risk mitigation and institution building.

Conclusion

In this paper it was argued that one reason for the limited emergence of individual farming and the continued importance of traditional farming in Central and Eastern Europe may be the presence of price risk, in combination with differences between the alternative farm types. These include both differences in economic relations (access to credit and subsidies) and in internal farm features such as governance type and consumption behaviour. Given output price risk, these factors imply different incentives to the traditional farm manager and the individual farm operator and tend to facilitate a divergence in farm size. The theoretical conclusion is that individual farmers are likely to be more sensitive to risk and accordingly to under-produce to a larger extent than do traditional farm managers.

An empirical assessment showed that risk exposure is indeed smaller for individual compared to traditional farms, even while the latter are usually more diversified in production. The risk-based view on structural change was thus shown to be in line with the available data. Although there are important qualifications to this conclusion, the suggestion is that consideration of risk and of governance structures may be fruitful in understanding structural change in agriculture during the transformation.

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Appendix: Proofs

Proposition 1:

$E(V_y\, y_K) = E(V_I I_K) = 0$

$E(V_y(pF_K - p^K) = E(V_I(1\text{-}t)(pF_K - p^K) = E(V_I(pF_K - p^K) - t\cdot E(V_I(pF_K - p^K)$

$F_K E((V_y)\, p - \overline{p}) = F_K E((V_I)\, p - \overline{p}) - t\cdot E(V_I(pF_K - p^K)$

$COV(V_{y,}p) = COV(V_{I,}p) – (t/F_K)EV_I(pF_K - p^K)$

Note that $COV(V_{y,}p)$, $COV(V_{I,}p) < 0$ and $pF_K > p^K$ and $t>0$

$\Leftrightarrow COV(V_{y,}p) < COV(V_{I,}p)$

Proposition 2:

$E(V_y\, y_F)_s = E(V_y y_F)_m = 0$

$E(V_y p)_s = E(V_y(k/n)p)_m$

$E(V_y p- \overline{p})_s = (k/n)E(V_y p - \overline{p})_m$

$(k/n) <(>) 1 \quad \Leftrightarrow \quad COV(V_{y,}p)_s <(>) COV(V_{y,}p)_m$

Proposition 3:

$E(V_y\, y_F)^i = E(V_y y_F)^t = 0$

$\wedge \quad E(y)^t > E(y)^i \quad \Leftrightarrow \quad E(V_y)^i > E(V_y)^t$

$\wedge \quad var\,(y)^i > var(y)^t \quad \Leftrightarrow \quad COV(V_{y,}p)^i < COV(V_{y,}p)^t$

Proposition 4:

$E(V_y\, y_F)^a = E(V_y y_F)^b = 0$

$E(V_y\, p)^a = E(V_y(\alpha p+ p_v(1\text{-}\alpha))^b = \alpha E(V_y\, p)^b + p_v(1\text{-}\alpha)E(V_y)^b$

$E(V_y p)^a / E(V_y p)^b = \alpha + (\, p_v(1\text{-}\alpha)E(V_y)^b / E(V_y\, p)^b)) = \alpha + (1\text{-}\alpha)\, (p_v/E(p))$

$p_v/E(p) > 1 \quad \Leftrightarrow \quad E(V_y\, p - \overline{p})^a > E(V_y\, p- \overline{p})^b$

$COV(V_{y,}p)^a > COV(V_{y,}p)^b$

Notes

[1] The earliest detailed articulation of this view in the transformation era is Schmitt (1993), originally written in 1990. The argument, an application to post-socialist farming of theoretical work on household production by Pollak (1985), was that the *raison d'être* for collective, large-scale production is the existence of economies of scale or scope. However, in most of the socialist economies, farms had a number of workers far exceeding the size of farms on which generalisations about scale and scope economies are based (Pryor, 1992:147). In addition, in much of agriculture, technical economies of scale and scope are argued to be soon outweighed by diseconomies in the organisation of production, and particularly of labour (Ferenczi, 1994:403). In the spirit of Alchian and Demsetz' (1972) seminal paper, it was argued that team production in agriculture generally implies high monitoring and management costs. The reasons include the information asymmetry problem between managers and workers, the sequential and interdependent nature of farm jobs, the existence of seasonal work and labour peaks, and the spatial dispersion of farm work. For these reasons, the farm size (in number of employees) that is regarded as optimal with regard to the production process is not expected to exceed family-farm size. In this mode of farming (here referred to as the individual farm), organisational diseconomies are argued to be largely excluded. Wage labour is not used and shirking or free-riding is supposedly difficult because of the small size, the hierarchical structure and the externally enforced continuation of relations within the household 'labour force' (Deininger, 1995). For contemporary expositions of the argument, see Sarris *et al*. (1999: 315-317) or Mathijs *et al.* (1999:4-8).

[2] Figures are percentages of Total Agricultural Land. The year of measurement varies between 1996 and 1998, except for Albania (1995). Note that Poland and former Yugoslavia, while geographically in the Central and Eastern European area, are not relevant here. In both countries (and their successor states), family farms were dominant throughout the communist era, and de-collectivisation in the sense defined was not an issue in the transformation.

[3] For interview findings, see Bezemer (1999)

[4] The actual distribution was unknown due to the rapid growth of their number during the transformation and problems of definition.

[5] The response rates for both surveys were 16 % for traditional farms and 18 % for individual farms - rather low, although it is difficult to decide what the standard for comparison should be. In mail surveys in general in the Western European context a response rate "below 30 %" is normal (Fowler, 1984:67); but one can think of many reasons for both a higher and a lower percentage in the Central European agricultural setting. In similar, previous work, the response rate is typically not reported - see Majerová (1997) for Czech agriculture; World Bank (1995) for various CEE countries; Davis and Gaburici (1999) for Romania; Wolz et al. (1998) for Slovakia; Mathijs et al. (1999) for the Czech Republic; and Lerman et al. (1998) for Armenia.

In these studies it is not always clear which survey method was used (mail survey, self-administered survey, group survey, telephone survey, etc.). For a more detailed discussion of the self-selection bias in the present sample, its possible causes, and implications for analyses, see Bezemer (2001).

[6] Additionally, information in EBRD (1999), MACR (1994 -1999), and OECD (1995) was used to account for developments in productivity and for inflation. A detailed appendix describing the matching procedure is available on request.

[7] We analyse the implication of output price risk rather than fluctuations of input prices or of yields/productivity, since output prices appear to constitute the largest risk factor. Yet the same type of argument could be made for other risk sources.

[8] The basic assumption of this argument is a link between price fluctuations and utility of the farm operator. This may not always be valid. Price variability need not affect utility if wealth is sufficiently high to provide a buffer, if futures markets are used to hedge price risk, or if forward contracting is possible (*e.g.* Newbery and Stiglitz, 1982:99). However, farms in Central and Eastern European agriculture generally operate under none of these conditions. In the case of the Czech Republic, farm financial resources are typically limited, and hedging or forward contracting as risk-management tools have not yet started to develop in agribusiness (see *e.g.* MACR, 1999; Csaki *et al*., 1999:39).

[9] Subscripts denote derivatives, superscripts refer to goods (or notes, as here).

[10] In keeping with accounting conventions, the farmer is here assumed to value his own labour in monetary terms. This assumption can be relaxed without consequences for the subsequent analyses.

[11] For the sake of brevity, in the rest of this paper I will use the terms 'traditional-farm owners', or 'owners of a corporate farm' to refer to the people who in fact own only a *part of* a traditional farm (i.e. members in co-operative farms and shareholders in farm companies).

[12] Note that Central and Eastern European farms are frequently loss-making, so that marginal costs are larger than marginal revenues and income y is negative. In such cases (p^K-pF_K) is positive and COV(V_yF_K), COV(V_I,p) still negative, while the same results obtain. The results suggest that both the usually completely fixed wages of managers and the low marginal productivity of factors of production (here: capital) in Central and Eastern Europe would cause the difference in investment and production to remain large.

[13] The ceteris paribus condition captures other variables that affect price risk exposure such as the degree of diversification and location. The validity of these will be considered below.

[14] The restriction to only *professional* rather than all individual farms is sensible, since other individual farmers typically do not market a considerable part of their produce, and to that extent are not subject to price risk. The present, and following arguments do not apply to such producers. Their position with regard to risk will be analysed below in proposition 4.

[15] Since the cost function is here not relevant, we consider $E(V_y y^f_F)$ rather than $E(V_y y^f_K)$ which gives more algebra but the same result.

[16] Assuming that (1) members weigh the costs of exerting influence (e.g. costs of collecting information, of travel, of deliberation, etc.) to its benefits (farm strategy in owners' interest), (2) that costs are largely fixed, and (3) that benefits are proportional to the size of the ownership state, only those members with relatively large stakes in the farm should be considered. A proxy for ownership stakes that could be used was the size of land owned by members. This was reported in the survey in three categories: less than 5, 5-10 and over 10 hectares. It was assumed that only the last category contained influential members (this was 8 % of all members on average). Members' claim to revenues in this group was then assumed to be proportional to the share of farm land they owned (as distinct from the assumption of overall equal claims employed above). Assuming minimal land ownership in the other two categories (.5 and 5 hectares on average), claims to revenues of the influential members proportional to their share in land were calculated. This procedure resulted in much higher revenue levels per members in this group than the overall average used above (a ninefold increase on average). Still, even under these strict assumptions only a quarter (11 out 43 valid observations) had average revenues per member exceeding the professional individual-farm average level of revenues.

[17] This second effect is relevant only to the extent that decision makers' incomes depend on farm (agricultural or other) revenues. As we have seen, this extent is limited for both managers and owners

[18] Price changes in per cent rather than in index points were used in order to avoid sensitivity of the risk measure to the base year of indexing.

[19] There was no series available for the number of individual farms businesses rather than people employed in it for the entire 1991-1998 period. In 1998 there were 32,500 people employed in 22,971 businesses, with the majority being single-family businesses.