Corporate farm size determinants in transitional economy: the case of the Moscow region

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Abstract

A set of dynamic DEA models is applied to investigate size determinants on the Moscow region corporate farms during 1996-2004. The institutional theoretical framework is found to be relevant to explaining corporate farm sizes and their changes in the Moscow region, unlike the neoclassical framework. Farms' opportunities to utilize returns to scale for improving performance are minor. Rank correlation between performance and size indicators is positive. This cannot be comprehensively explained by wider opportunities to grow that are available to best-practice farms. The theoretical expectation of pursuing lower transaction costs as a motivation for a large-scale farm business complies with the estimations.

Keywords: farm size, return to scale, dynamic DEA, Moscow region, transitional economy, corporate farms.

1. Introduction

The economic reform in Russia has established free entrepreneurship in agricultural business and contributed in developing its institutional base. Although this process is far from completion, farms are no longer obliged to operate in a prescribed scale. However, it may take much time and large expenses to optimize farm sizes.

In early 1990s many researchers, especially outside Russia, expected that small family farms in the former USSR would be more viable than large corporate farms (World Bank, 1992; see also Lerman, 2001). As Uzun (2005) points, these expectations originated in Western farming experience. Truly, that time the family farms were intensively emerging. At present this expectation seems to fail. Although average farm size was reducing during the transitional period (rather due to shrinking reproduction than on intent), a body of studies (e.g. Altukhov, 2005; Miloserdov, 2005) argue that the smaller the farm is the poorer it operates.

Arguments to the opposite point of view are also available (Garadzha et al., 1998; Uzun, 2005). Epstein and Schulze (2005) found that the correspondence of profitability to corporate farm size is uneven, having at least two optima. Lerman (1998) underlines that emergence of Western-type individual farming is hampered by a variety of obstacles to the economic reform ranging from national political difficulties to individual risk aversion. A recent study of Spoor and Visser (2004) argues that large farm enterprises prefer the strategy of building up large-scale business networks. This way they protect themselves from market pressure and persist in using available resources extensively.

Dependence of the results on specific farm sets and methodologies suggests absence of well-defined advantages of any farm size in Russia. The causes of this situation are studied in Rys'miatov and Kuznetsov (2002).

Since 2000, average farm size decreases slower than in 1990s (Chart 1). As a contrasting tendency, an intensive process of capital concentration emerged in Russian agriculture in a form of various so-called "integrated structures"[1]. Of these, agroholdings draw the majority of attention (Rylko and Jolly, 2005; Kireeva et al., 2003; Oganesov, 2004; Hockmann, 2005). The forms of concentration are different. They are likely to depend, among other factors, on political preferences of regional establishment.

Nowadays a great deal of agricultural market in Russia is occupied by corporate farms, often integrated into large and extra-large structures. In 2004 these farms produced 42.8% of gross agricultural production (GAP) and sold 62% of grain production, 58% of potatoes, 89% of vegetables, above 80% of meat and 87% of milk[2]. In 1998 their share in GAP was 39,2%[2]. Of the produced amount, 60% of grain, 51% of potatoes, 92% of vegetables, above 85% of meat and 78% of milk were sold[3]. An opposite pole is small (usually less than 1 ha) individual plots (51.3% of GAP in 2004). In 1998 their share in GAP was 58.6%[2], while only 10% of potatoes and vegetables, 18% of milk, 22% of meat produced on these plots accessed markets[4]. Demonstrating high efficiency of land use in comparison to the corporate farms, individual plots play a minor role on agricultural production markets. Consequently, they are weakly sensitive to price signals.

As soon as the observed size changes cannot be reliably associated with optima-seeking intents, two questions arise. First, how to identify true intents, which affect farm sizes, and their evolution during transition? Second, is there a contradiction between scale efficiency and transaction costs minimization? The aim of this study is to contribute in answering these questions, limiting their scope to the corporate farms located in the Moscow region.

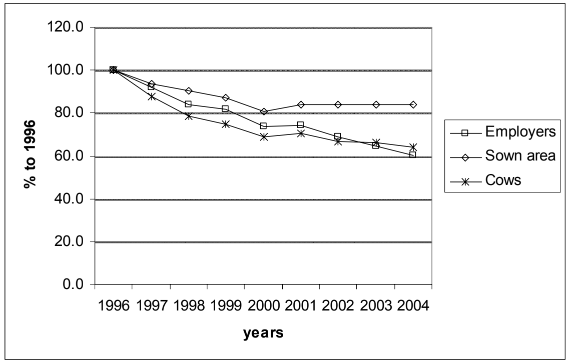
A theoretical contribution of this paper is a framework of addressing the problem of farm size determinants from both institutional and neo-classical points of view. The methodology is enriched with the approach that identifies the relevance of the both theories to explanation of relations between size and performance.

[1] This term is used by Russian-speaking authors. Spoor and Visser (2004) call them business networks.

[2] Author's calculations using data of Rosstat (2006). The precise share of sold meat cannot be calculated, as the data are available on production of *meat* and on sales of *livestock for meat* (in live weight).

[3] Author's calculations using data of Goskomstat (2004). The precise figure on meat is not available.

[4] Goskomstat (1999). More recent data are not available.



Source: Rosstat (2006).

Chart 1. Size changes of Russian corporate farms[5]

The following three hypotheses are tested.

a) *Increasing size of a farm increases its performance.*

This hypothesis relies on the above mentioned papers by Altukhov (2005)[6], Miloserdov (2005)[6], Rys'miatov and Kuznetsov (2002).

b) *A sample Moscow region corporate farm operates at decreasing return to scale (RTS).*

Pursuing better transaction costs to sales ratio the farms can overgrow their optimal sizes with respect to the topology of the production possibility set.

c) *During the transitional process average size of best-practice farms increases.*

If a best-practice farm has sufficient resources and hypothesis (a) holds, both economic incentives and opportunities are expected to cause the farm's growth.

The choice of the studied region is determined by data availability. The findings with respect to the Moscow region cannot be attributed to other regions of Russia, where the marketing opportunities of farms are narrower. However, the outcome of this study can serve as a source of hypotheses about farm size determinants for studies of corporate farms located in those regions.

2. Methodology

To address farm size issues, this paper considers two theories. The first is *neo-classical theory*, which explains a size of an agricultural production unit by means of economies of scale. Following it, the size is optimal at the constant RTS, as the unit operating at constant RTS does not benefit from varying a production scale. The second is *institutional theory*. It considers the balance of trans-

[5] In Rosstat (2006) corporate farms are called 'agricultural organizations'.

action costs and management costs, supposing that an optimal size of a business unit should minimize the sum of both.

A priory considerations suggest that the institutional theory is more relevant to transitional economies. A characteristic feature of an underdeveloped market is high transaction costs. They are likely to push production unit sizes to increase, otherwise a unit could not have enough resources to finance the costs of transactions. As for the neo-classical theory, it is more likely to be applicable to production units than to business units. Indeed, formally a business unit can grow by means of increasing a number of production units each operating at constant RTS.

Presence of scale inefficiencies and their significant dependence on size of a corporate farm signals that the neo-classical framework can be used to identify opportunities to optimize production scale. If a correspondence between size and scale efficiency is an only significant source of a correspondence between size and overall efficiency, the institutional aspects of size are not substantial. Otherwise the relevance of institutional theory is not rejected by the applied data and methodology[7].

The pre-requirements of parametric statistical analyses in the studied set are not fulfilled. Thus, to approach scale effects during transactional period, a set of non-parametric dynamic DEA (DDEA) models was used originating at Nemoto and Goto (2003) studies. Analysis of intertemporal frontier is based on the assumption of a production possibility set Φ_t such that

$$\Phi_t = \{(\mathbf{x}_t, \mathbf{k}_{t-1}, \mathbf{k}_t, \mathbf{y}_t) \in \mathbb{R}_+^{l+m} \times \mathbb{R}_+^{m+n} \mid (\mathbf{k}_t, \mathbf{y}_t) \in Y(\mathbf{x}_t, \mathbf{k}_{t-1})\}, \qquad (1)$$

where l is a number of variable inputs, m is a number of quasi-fixed inputs, n is a number of outputs, $t \in \{t_0, t_1, \ldots, T\}$ is a time period, $\mathbf{x}_t$ is a $l\times1$ variable inputs vector, $\mathbf{k}_t$ is a $m\times1$ quasi-fixed inputs vector, $\mathbf{y}_t$ is a $n\times1$ outputs vector, Y is a $\mathbb{R}_+^{l+m}$ to $\mathbb{R}_+^{m+n}$ production correspondence. The common regularity conditions are assumed (ibid.).

Given this, the *overall dynamic efficiency*, in its output-oriented specification, can be defined as ODE = $R(\overline{\mathbf{k}_0})/\overline{R}$, where $\overline{R}$ is an actual cumulative revenue of a particular decision making unit (DMU) for the period from t_0 to T (discounted to t_0) and

$$R(\overline{\mathbf{k}_0}) = 1\Big/\max_{\{\mathbf{y}_t, \mathbf{k}_t\}_{t=1}^T}\left\{\sum_{t=1}^{T}\gamma_t(\mathbf{w}_t\mathbf{y}_t) \mid (\mathbf{x}_t, \mathbf{k}_{t-1}, \mathbf{k}_t, \mathbf{y}_t)_{t=1}^T \in \times_{t=1}^T \Phi_t, \mathbf{k}_0 = \overline{\mathbf{k}_0}\right\}, \qquad (2)$$

where dashed symbols are bound to actually observed values, γ_t is a discount factor, $\mathbf{w}$ is a $n\times1$ output prices vector.

[6] The evidence presented in these two papers might be affected by inverse causality, as efficient farms have wider opportunities to grow.

[7] To prove a stronger statement about the rejection of irrelevance of the institutional theory, an access to a transaction costs and management costs proxies is necessary. These data are not available.

The methodology of estimating RTS and scale efficiency follows Banker (1984); Banker, Charnes and Cooper (1984). The RTS direction is signaled by a dual value of constraint $\mathbf{i}\boldsymbol{\lambda}_t = 1$ (referred infra as *VRS constraint*), which enables variable RTS in linear programming specifications of DEA problems (details are available in ibid.)[8]. The *scale efficiency* is defined as a ratio of efficiency scores obtained from the linear programming specifications with and without imposed constant RTS. The tests for significance of correspondences between size and efficiency indicators are based on non-parametric Spearman's rank correlation measure, which imposes background assumptions which are relatively easy to fulfill.

3. Empirical model and data

The empirical specification used in this study is aimed at a wider set of research goals than those of this paper. This section presents the model to an extent that is necessary to clarify the subsequent analysis. The complete specification is available in the working paper by Svetlov and Hockmann (2006).

The problem (3) is aimed at estimating overall dynamic efficiency (ODE) of farm n.

$$\begin{aligned}
&\max_{\{\mathbf{y}_{nt}, \mathbf{k}_{nt}, \boldsymbol{\lambda}_{nt}\}_{t=1996}^{2004}} \sum_{t=1996}^{2004}\gamma_t(\mathbf{w}_t\mathbf{y}_{nt})\\
&s.t.\quad \overline{\mathbf{x}_{nt}} - \mathbf{X}_t\boldsymbol{\lambda}_{nt} \ge \mathbf{0},\ t = 1996,\ 1997, \ldots, 2004;\\
&\qquad \overline{\mathbf{k}_{n,1995}} - \mathbf{K}_{1995}\boldsymbol{\lambda}_{n,1996} \ge \mathbf{0};\\
&\qquad \mathbf{k}_{n,t-1} - \mathbf{K}_{t-1}\boldsymbol{\lambda}_{nt} \ge \mathbf{0},\ t = 1997,\ 1998, \ldots, 2004; \qquad (3)\\
&\qquad \mathbf{K}_t\boldsymbol{\lambda}_{nt} - \mathbf{k}_{nt} \ge \mathbf{0},\ t = 1996,\ 1997, \ldots, 2003;\\
&\qquad \mathbf{K}_{2004}\boldsymbol{\lambda}_{n,2004} - \overline{\mathbf{k}_{n,2004}} \ge \mathbf{0};\\
&\qquad \mathbf{Y}_t\boldsymbol{\lambda}_{nt} - \mathbf{y}_{nt} \ge \mathbf{0},\ t = 1996,\ 1997, \ldots, 2004;\\
&\qquad \boldsymbol{\lambda}_{nt} \ge \mathbf{0},\ \mathbf{y}_{nt} \ge \mathbf{0},\ \mathbf{k}_{nt} \ge 0,\ t = 1996,\ 1997, \ldots, 2004,
\end{aligned}$$

where $\mathbf{y}_{nt}$ is a 4×1 output vector of farm n in year t, $\mathbf{k}_{nt}$ is a 4×1 vector of quasi-fixed (reproducible) inputs of farm n in year t, $\boldsymbol{\lambda}_{nt}$ is a $\zeta_t\times1$ intensity vector in year t, $\mathbf{w}_t$ is a 1×4 vector of year t output prices, γ_t is a discount factor in year t, $\mathbf{x}_{nt}$ is a 6×1 vector of fixed inputs, $\mathbf{X}_t$, $\mathbf{K}_t$, $\mathbf{Y}_t$ are $6\times\zeta_t$, $4\times\zeta_t$ and $4\times\zeta_t$ matrices of year t farm-specific data on fixed inputs, quasi-fixed inputs and outputs, ζ_t is a number of farms in the year t subset. The dash over a symbol means that the parameter is bound to the corresponding actual datum.

The fixed inputs are the number of poultry, number of employees, arable land area, haylands and pastures area, long-term loans, short-term loans. The quasi-fixed inputs are number of cows,

[8] This approach is extended by Banker and Thrall (1992) in order to make allowance for the presence of alternative solutions of DEA problems. However, this situation is of actual importance only for efficient farms (Førsund and

number of pigs, depreciation (a proxy for fixed assets), production costs financing. The following outputs are considered: grain (in kind), other crop production (revenue), milk (in kind), other animal production (revenue). Only sold production is reckoned as an output. For grain and milk, average over the region year-specific prices are used. The source data for calculating γ_t are average interest rates on short-term (one year and shorter) rouble credits that are issued in the given year by credit organizations to juridical persons[9] (better proxies are not available).

TDE (technical dynamic efficiency) scores are obtained from the specification which is similar to (3) but uses an objective function "maximum of minimal relative increments of an output in 2004 to its actual value" (Svetlov and Hockmann, 2006, specification (11)). ADE (allocative dynamic efficiency) is defined as ODE/TDE.

To account for costs of disposal, (3) is transformed into the following problem:

$$\max_{\{\mathbf{y}_{nt},\mathbf{k}_{nt},\boldsymbol{\lambda}_{nt}\}_{t=1996}^{2004}} \sum_{t=1996}^{2004} \gamma_t(\mathbf{w}_{nt}\mathbf{y}_{nt})$$

$$\begin{aligned} s.t.\quad & \underline{\mathbf{x}_{nt}} \le \mathbf{X}_t\boldsymbol{\lambda}_{nt} \le \overline{\mathbf{x}_{nt}},\ t = 1996,\ 1997,\dots,2004; \\ & \overline{\mathbf{k}_{n,1995}} - \mathbf{K}_{1995}\boldsymbol{\lambda}_{n,1996} = \mathbf{0}; \\ & \mathbf{k}_{n,t-1} - \mathbf{K}_{t-1}\boldsymbol{\lambda}_{nt} = \mathbf{0},\ t = 1997,\ 1998,\dots,2004; \\ & \mathbf{K}_t\boldsymbol{\lambda}_{nt} - \mathbf{k}_{nt} \ge \mathbf{0},\ t = 1996,\ 1997,\dots,2003; \\ & \mathbf{K}_{2004}\boldsymbol{\lambda}_{n,2004} - \overline{\mathbf{k}_{n,2004}} \ge \mathbf{0}; \\ & \mathbf{Y}_t\boldsymbol{\lambda}_{nt} - \mathbf{y}_{nt} \ge \mathbf{0},\ t = 1996,\ 1997,\dots,2004; \\ & \boldsymbol{\lambda}_{nt} \ge \mathbf{0},\ \mathbf{y}_{nt} \ge \mathbf{0},\ \mathbf{k}_{nt} \ge 0,\ t = 1996,\ 1997,\dots,2004. \end{aligned} \qquad (4)$$

Here the below-dashed symbols indicate non-disposable amounts. They are bound to actually available input amounts, excepting the case of arable land. Its non-disposable area is approximated by the data on sown area.

The above mentioned specifications also allow computation of static efficiency scores. For this purpose all $\mathbf{k}_{n,t}$ are bound to the corresponding values from the source data, thus disallowing free intertemporal allocation of input-output mix. Finally, any of the above mentioned specifications can be subjected to the constraint $\mathbf{i}\boldsymbol{\lambda}_t = 1$ in order to relax the constant return to scale assumption.

The data source is a registry of the Moscow region corporate farms for the period 1995…2004 provided by Rosstat[10]. Depending on a year, the empirical models use 231 to 387 observations, forming unbalanced panel of 3081 observations. The efficiency scores and RTS measures are

Hjalmarsson, 2002). On this reason, no special efforts to address this problem have been made.

[9] The data on interest rates are available at the web site of Central Bank of Russian Federation <http://www.cbr.ru/>

[10] Rosstat (former Goskomstat) is a federal statistical agency of Russian Federation.

computed for 175 farms whose data are available for all the ten years. For the more detailed information on the data refer to Svetlov and Hockmann (2006).

4. Results

4.1. Size and performance

Traditionally, Russian corporate farms are spoken about as large. In case of Moscow region their average size (based on the year 2004 data of the Moscow region corporate farms registry) in terms of workers is 213, in terms of farmland it is 3384 ha. However, in terms of sales they are not very large ($1.80 million per farm). Average amount of bank loans per farm is $484 thousand.

Table 1 characterizes the relation between year-specific farm size indicators and three different efficiency scores, which characterize overall, allocative and technical dynamic efficiency over the whole nine-year period. The relation is positive and significant in the majority of years. This can be explained by conjoint effect of the following causes: dependence of size on efficiency caused by faster growth of farms displaying higher performance; dependence of RTS on size (which is addressed in the next subsection); other non-technical factors including the wider ability of large farms to save on transaction costs.

Table 1: Spearman's rank correlations between dynamic efficiency scores and size indicators.

Year	1996	1997	1998	1999	2000	2001	2002	2003	2004
ODE									
Revenue	0.640	0.693	0.753	0.798	0.818	0.841	0.839	0.833	0.826
Costs	0.467	0.517	0.599	0.693	0.728	0.760	0.759	0.763	0.750
Depreciation	0.242	0.242	0.230	0.307	0.346	0.467	0.510	0.575	0.553
Cows	0.207	0.272	0.356	0.418	0.482	0.533	0.564	0.634	0.649
ADE									
Revenue	0.247	0.318	0.375	0.429	0.426	0.471	0.491	0.473	0.451
Costs	0.235	0.265	0.295	0.367	0.385	0.418	0.434	0.427	0.403
Depreciation	0.262	0.304	0.301	0.304	0.342	0.364	0.351	0.362	0.303
Cows	0.104	0.130	0.199	0.234	0.268	0.297	0.307	0.347	0.348
TDE									
Revenue	0.482	0.499	0.521	0.550	0.586	0.560	0.535	0.535	0.548
Costs	0.299	0.314	0.395	0.471	0.509	0.512	0.485	0.500	0.513
Depreciation	0.058	0.070	0.029	0.094	0.056	0.180	0.265	0.288	0.286
Cows	0.102	0.165	0.206	0.237	0.284	0.311	0.325	0.381	0.387

Rank correlations that are insignificant at α=0.05 are given in small print.
Rank correlations of farmland area to ODE, ADE and TDE are insignificant in all years.
Source: author's calculations.

Faster growth of efficient farms actually contributes to the dependencies reflected by Table 1. Presence of this effect is proved by rank correlations between ODE and growth indicators.

Relative revenue growth positively correlates (in terms of ranks) to ODE in 5 years of 8 (up to 0.424 in 1998) and insignificantly in the remaining 3 years. Relative herd population growth positively correlates to ODE in all years (up to 0.400 in 2000). However, higher significance of rank correlations in Table 1 than of rank correlations between ODE and growth indicators suggests that the influence of the remaining factors may also appear to be significant.

This inference can be corroborated by accessing rank correlation between a *size* indicator and a residual of an efficiency score in its regression to the corresponding *growth* indicator. Significant rank correlation would ascertain a significant dependence of efficiency on scale indicator under the reservation that the relation between the efficiency and the growth indicator is close to linear. Insignificant rank correlation would leave the question open. Actually the majority of the rank correlations of ODE adjusted for growth impact and size indicators are found to be significantly positive. Particularly, in case of revenue this is true for all years, in case of costs and depreciation it is true for all years but two. In case of cows, however, the significantly positive rank correlation is observed only in 3 years, while in remaining 5 years this correlation is insignificant.

To summarize, the data and estimations support the hypothesis (a) about positive impact of size on performance. The inverse impact of performance on size (per growth), although being significant in many years, plays a secondary role in the observed correspondence between size and efficiency measures.

4.2. Direction of RTS

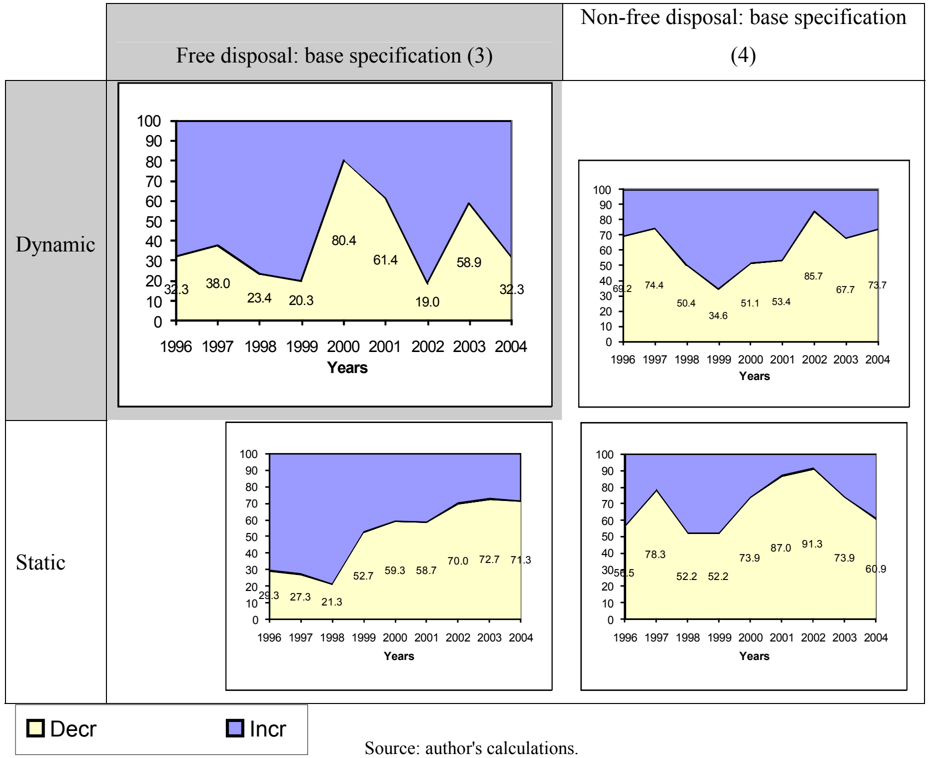
An average over the 175 farms value of ODSE (overall dynamic scale efficiency), defined as ODE/ODPE[11], is 0.956, varying from 0.758 to 1. Compared to ODE, which varies from 0.241 to 1 with average 0.503, ODSE characterizes the production scale as a minor source of inefficiencies. As the size of these farms (in terms of revenue) varies from 4.5 to 333.6 million roubles (average is 64.7), this result suggests that within this range nearly neutral return to scale prevails.

Chart 2 provides a more detailed view over the scale effects. The northwest diagram presents the results obtained from specification (3), which is free of additional analytical assumptions. Neither increasing nor decreasing RTS reliably dominates. A volatile share of each suggests that changes in technologies and prices during a year can change the direction of RTS on many farms. In this respect, the motivation for adjusting scale to achieve a neutral RTS is weak. Adjustment needs long-term decisions, but they cannot be justified reliably under the volatility of RTS direction. In addition, rank correlations of revenue, costs, depreciation, cows and farmland to ODSE are found to

[11] ODE is computed from specification (3) and ODPE (overall dynamic pure efficiency) is computed from the same specification expanded with the condition $\mathbf{i}\boldsymbol{\lambda}_t = 1$.

be insignificant in all years. So, the existing scale inefficiencies are evenly distributed among farms of any size. This suggests that the farms utilize the theoretical opportunity to secure scale efficiency by varying a number of production units, each operating at nearly constant RTS.

Other three diagrams on Chart 2 present the impact of specific assumptions on scale effects. The DDEA specifications considering congestion indicate wider spread of decreasing RTS. Actually, as neither free nor ultimately costly disposability is precisely attributable to real farm inputs, the true situation with RTS is likely to be represented by some intermediate between left and right columns of the chart. The results from dynamic and static specifications differ largely. Hence, under the conditions of transitional economy the simplifications of short-term models may critically affect the validity of conclusions about optimal farm size.



Source: author's calculations.

Chart 2. Annual structure of farms with respect to return to scale in the sense of overall efficiency.

Concluding, the research hypothesis (b) about prevailing decreasing RTS is not supported by the estimations. The properties of reference technology defined by the sample are such that a large variety of farm sizes is characterized by RTS that is close to neutral. A dominant contribution to the positive rank correlations between size and performance indicators belongs to other factors than RTS. This result does not contradict to the proposition about the importance of savings on transaction costs, which are the largest on large farms. It conforms to the theoretical expectations of importance of transaction costs as a size determinant under the transitional economic environment. However, other propositions are also possible.

4.3. Size of best-practice farms

As it follows from subsection 4.1, in many years growth of a farm significantly depends on its performance. In this respect, the following question arises: whether the farms demonstrating relatively high performance are able to withstand to the destructive factors that take place during the transitional process?

Table 2: Comparison of size indicators of sample and best-practice farms.

Size indicators \ Year	1996	1997	1998	1999	2000	2001	2002	2003	2004
Average over 175 farms, % to 1996									
Revenue	100.0	95.9	82.4	100.9	96.8	105.6	117.5	101.3	98.0
Farmland	100.0	99.6	99.5	103.0	104.4	104.8	106.1	106.3	101.8
Arable land	100.0	98.5	99.7	102.9	104.1	105.0	106.1	106.3	101.5
Production costs	100.0	96.7	80.9	83.9	86.3	88.5	87.6	92.9	82.1
Depreciation	100.0	78.8	49.2	28.1	21.8	20.1	18.7	18.6	15.9
Dairy cows number	100.0	91.3	84.4	81.3	79.2	76.1	73.2	69.5	64.8
Average over best practice farms, % to average over 175 farms in 1996									
Revenue	141.8	144.8	158.1	239.3	221.1	264.8	256.1	243.0	213.2
Farmland	95.6	95.9	97.3	102.9	106.5	108.1	111.4	111.4	110.6
Arable land	92.4	93.2	94.5	100.4	105.1	107.2	110.3	110.3	108.7
Production costs	31.5	33.3	30.4	37.7	40.6	47.5	50.9	54.7	45.3
Depreciation	33.3	29.8	22.1	13.3	10.6	10.7	12.4	12.9	8.4
Dairy cows number	40.1	36.9	35.4	36.1	38.3	39.1	39.4	38.3	37.7

Best-practice farms are the farms belonging to the top sextile with respect to ODE.
Monetary indicators are adjusted for inflation[12].
Source: author's calculations.

Table 2 gives a positive answer to this question. The farms belonging to the top sextile on performance (measured with ODE) demonstrate relatively stable growth during the studied period. Being initially (in 1996) larger than an average sample farm only in terms of revenue, best-practice

farms are more successive in expanding their businesses. By 2004 no one of size indicators for the whole sample is noticeably larger than that of 1996. As for the best-practice farms, all of these indicators but depreciation and cows number increased during the same period. The trends of depreciation indicate that the transitional process in the Moscow region is associated with de-industrialization of agricultural production. This process is slower on best-practice farms.

The revenue per unit of production costs, depreciation and cows in both samples increase, indicating a positive impact of market transition on efficiency of resources. On best-practice farms this impact is larger and, in contrast to the whole sample, also spans land resources.

These observations support the research hypothesis (c) about the propensity of best-practice farms to grow with the reservation concerning fixed assets (approximated by depreciation). However, the specific conditions of year 2004 appear to be more hampering for best-practice farms than for sample farms. Indeed, the revenue decreased by 12.3% in comparison to the previous year (over all farms only by 3.3%). The depreciation lowered by 34.9% (versus 14.5% over all farms) indicating a large loss of fixed production assets. It forms the subject of future studies to figure out whether these farms have overgrew their optima and intentionally shrink production scale or some year-specific condition matters.

In order to be included in the studied sample, a farm must exist during the ten year period. So, the size indicators of the farms that either came to bankruptcy or cancelled their businesses on other reasons during 1996-2004 are not accounted in Table 2. This biases the sample trends positively making the picture of transition in the region more advantageous than it really is. However, validity of arguments in favor of the hypothesis (c) is not affected by this reservation.

5. Conclusions and discussion

This paper provides the methodological framework that addresses the research question about identifying the propensity of farm management with respect to farm sizes. By the instrumentality of this framework, on Moscow region corporate farms the importance of returns to scale as a motivation factor is found to be low. Contrarily, the influence of incentives to reduce transaction costs, to concentrate capital for market entry purposes does not contradict to the data and estimations. Hence, the institutional theoretical framework is found to be more relevant to explanation of farm size determinants in the transitional economy of the Moscow region than the neo-classical framework. This answers the first research question formulated in the introduction.

[12] Agricultural price indices are used to adjust revenue and industrial price indices are used to adjust costs and depreciation. The source of indices is Rosstat (2006).

With respect to the second research question it is found that the efficiency losses due to pursuing lower transaction costs per revenue by means of increasing farm size might only weakly affect overall farm efficiency.

The acceptance of the research hypothesis (a) provides evidence that there is a field for establishing and growth of business networks in the Moscow region agriculture in the sense of Spoor and Visser (2004). On one hand, these networks are a tool of decreasing the share of transaction costs in market price of agricultural production. Importance of this tool is substantial in the situation of lasting transition, when the transaction costs are theoretically expected to be high in comparison to well developed markets. On another hand, they facilitate collateral concentration and accessing external investment sources. In the circumstances of low liquidity of farmland and of resulting lack of collateral (Il'ina and Svetlov, 2006) this factor motivates to integration.

Having chosen the option to integrate into such a network, a farm secures the ability to adjust the production to optimal return to scale without facing negative impact of increasing transaction costs per unit of output. However, the failure of research hypothesis (b) suggests that currently there is no actual motivation to do so. The scale inefficiencies are low at the majority of farms in comparison to other sources of inefficiencies. The return to scale direction is volatile and cannot orient corporate farms in making long-term decisions affecting their sizes.

Support for the research hypothesis (c) makes it evident that the smaller the farm acting on transitional markets of the Moscow region the lower its chances to survive. In the transitional environment high performance and large size are jointly conditional. It is likely that a break-even size of a corporate farm exists (depending on specialization, assets composition and year) under that the expanded reproduction is not possible. Estimating this break-even size forms the agenda for future studies because of its importance for justifying regional agricultural policies. In strategic terms, however, these policies should be aimed at building effective market institutions, lowering transaction costs and forming pre-conditions for growth of farmland value, which provides farms with a valuable collateral. Such a strategy facilitates access to agricultural markets by smaller business units, positively influences resource allocation, innovation activities, employment and incomes.

The econometric techniques are available, both in parametric and non-parametric frameworks, that allow addressing the hypothesis (a) more precisely than it is done here. They allow characterizing impacts of both performance on growth and v.v. quantitatively. For the moment, the author is lacking resources that are necessary to use any of them. They are planned to be implemented in future.

It can be foreseen that, subject to successful transition, the inclination to gigantism in the Moscow region agricultural business will decrease. The lower the transaction costs and the higher the

price of land are the lower are the benefits of large-scale farming. However, the current situation is such that the majority of corporate farms must either grow or integrate in order to secure competitiveness and to survive.

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