The Determinants of Farm Growth, Decline and Exit in Estonia

Die bestimmenden Faktoren für die Vergrößerung, den Rückgang der Größe und den Ausstieg der landwirtschaftlichen Betriebe

Ants-Hannes Viira, Anne Pöder and Rando Värnik
Estonian University of Life Sciences, Tartu, Estonia

Abstract

The process of structural changes in Estonian agriculture is influenced by both socioeconomic factors that are similar in other western countries and transition-related factors. This current paper aims to investigate the effects of such socioeconomic factors on the probabilities of farm growth, decline and exit relative to retaining the previous farm size. The survey and agricultural registers' data are used for multinomial logit estimation. The results indicate that the farm growth probability is highest in the 40-49 year age group. The availability of successors significantly reduced farm exit probability, and the level of education of the farm operator increased the farm growth probability. While off-farm work was more probable in smaller farms and in cases of more educated and younger farm managers, it was evident that the off-farm employment of the farm operator significantly increased the probability of farm exit. While the larger farms have a higher probability of remaining in business, and lower probability to exit or decline, they do not have higher growth probability. Participation in a semi-subsistence farming scheme reduces the exit probability. It has been shown that farms founded during the beginning of transition due to restitution have lower decline and growth probabilities, indicating that such farmers are emotionally more inclined to maintain the farms of their forefathers.

Key words

structural changes; farm exits; farm growth; economic transition; semi-subsistence farming; Estonian agriculture

Zusammenfassung

Der Prozess der strukturellen Veränderungen in der estnischen Landwirtschaft wird von sozioökonomischen Faktoren, die ähnlich in anderen westlichen Ländern sind, sowie von mit dem Übergang verbundenen landesspezifischen Faktoren beeinflusst. Im diesem Artikel werden die Auswirkungen solcher sozioökonomischen Faktoren auf die Wahrscheinlichkeit des Wachstums, Rückgang der Größe und Ausstieg der landwirtschaftlichen Betriebe untersucht, im Vergleich zu der Lage, wenn die Größe sich nicht ändert. Für die Multinomialen Logit-Modelle werden Daten aus den Umfragedaten und Daten aus dem Landwirtschaftsregister verwendet. Die Ergebnisse zeigen, dass die Wahrscheinlichkeit des Wirtschaftswachstums eines Betriebes am höchsten ist, wenn der Betreiber zwischen 40 und 49 Jahre alt ist. Die Existenz von Nachfolgern hat eine negative Wirkung auf den Ausstieg. Das Ausbildungsniveau des Betreibers erhöht die Wahrscheinlichkeit des Wirtschaftswachstums des Betriebes. Es ist offensichtlich, dass die Beschäftigungsmöglichkeiten des Betreibers außerhalb des Landwirtschaftsbereichs die Wahrscheinlichkeit des Ausstiegs erhöhen. Während die größeren Betriebe deutlich seltener aussteigen oder ihre wirtschaftliche Größe zurückgeht, ist ihre Wachstumswahrscheinlichkeit auch nicht größer. Zur gleichen Zeit senkt die Teilnahme an einem Semi-Subsistenzbetriebe-Schema die Ausstiegswahrscheinlichkeit von Betrieben.

Schlüsselwörter

strukturelle Änderungen; Ausstieg der landwirtschaftlichen Betriebe; Wachstum der Betriebe; wirtschaftlicher Übergang; Semi-Subsistenzbetriebe Schema; estnische Landwirtschaft

1 Introduction

Expansion, contraction and exit are the farm development phases often associated to the farm family life cycle, which comprises of the entry, growth, maturity, decline, and exit stages. In the exit phase, the farm is handed over to the next generation or liquidated (BOEHLJE, 1973; POTTER and LOBLEY, 1992, 1996; LOBLEY et al., 2010). In Western countries, the number of farms is largely decreasing, implying that the remaining farms, on average, increase in size (GALE, 2003).

In the last 100 years, three structural breaks have occurred in Estonian agriculture, influencing both farm ownership and size structure. The first structural break occurred in 1918 when the Republic of Estonia was founded. At the time, 58% of the total land belonged to about 1,000 manors of the nobility, with the average holding being 2,114 ha. The rest of the land was operated by 51,600 farms with an average size of 34 ha. In 1920-30s, the manor lands were nationalised and new farmsteads were parcelled out. These reforms contributed to the creation of a new social order, in which the equitable distribution and individual control of property occupied a pivotal role. The stated aim of the spatial reconfiguration was to promote an egalitarian society and to encourage entrepreneurial individualism, as well as to bond citizens to the state and its cherished republican ideal, rather than to customary communal institutions. Therefore, the spatial reconfiguration of land rights was an important way of communicating egalitarian ideals and integrating the national territory (MAANDI, 2010). By 1939, the number of farms was 140,000 with an average size of 23 ha (PIHLAMÄGI, 2004).

The second structural break, collectivisation, began with the Soviet occupation in 1940. The main part of collectivisation occurred in 1949-1952, during which the land, assets and animals of the last private farms were collectivised. The restructuring of collective farms continued throughout the occupation: in 1949, there were about 9,000 collective farms; 326 collective and state farms with average area of 7,628 ha remained by 1989 (UNWIN, 1997).

The third structural break began at the end of the 1980s with establishment of private farms on the marginal land of collective farms. In 1989, aside from the collective farms, there were 828 private farms with average area of 25 ha. The first reforms and changes carried out during the years leading to the collapse of the Soviet Union culminated in the transition from socialist collectivised agriculture to market-based private farming after Estonia regained its independence. In 1991, the restitution of land to its pre-collectivisation owners and the privatisation of collective farms began (VIIRA et al., 2009a).

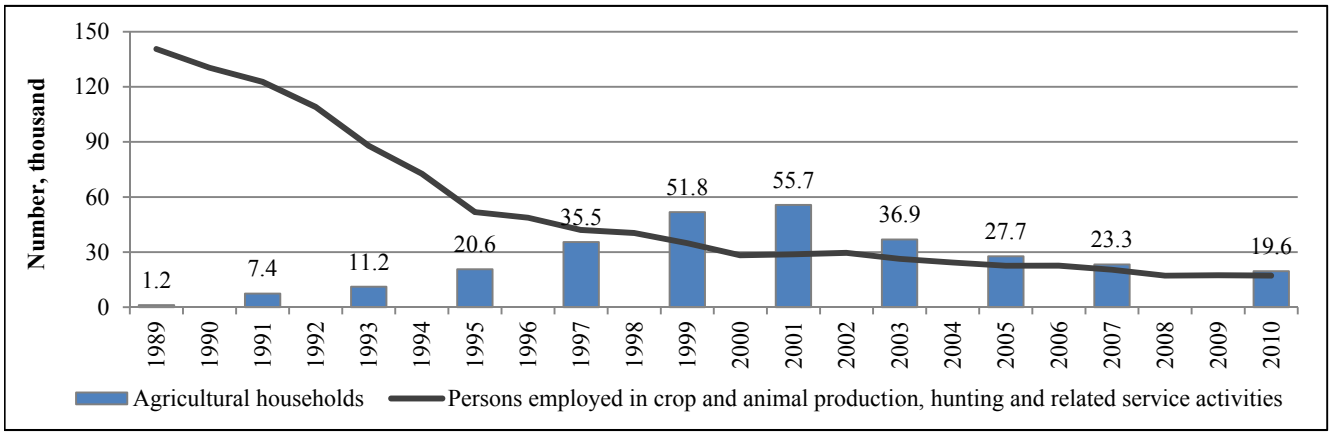
Since the continuity of the ownership was considered important, in part, the land, agricultural and ownership reforms of the 1990s followed the same ideological goals of the land reforms in the 1920s (CSAKI and LERMAN, 1994). In the political debate, the pre-Second World War family farms were presented as the ideal and natural way of agrarian structure in which the rightful owners of the land could use their property as they saw fit, as opposed to forced the collectivisation and industrialisation of Soviet agriculture in which the workers of collective farms had little property and no real interest in the fruits of their labour. The prevailing notion was that Estonian families would return to their rural roots in large numbers, creating family farms that would provide sustenance to the majority of the rural population, create strong families and rural communities.

In the case of CEEC land reforms, distributional effects involved two separate and sometimes conflicting issues: 1) the legal ('historical justice') demands of pre-collectivisation landowners whose land was confiscated by communist regimes or who were forced to participate in the collectivisation, and 2) social equity concerns (SWINNEN, 1999). In Estonia, the latter was addressed by allowing the opportunity to privatise land by pre-emptive rights (for people whose buildings were located on land subject to privatisation) or on general grounds (for rural inhabitants in the vicinity of their homes) (EMA, 2002). During the agricultural reform, a local reform committee in each collective farm decided how the farm's assets would be distributed for compensation to pre-war owners, privatisation or sale. From the economic point of view, the idealisation of family farming could be cited as a hindrance that led to the separation of many of the functioning collective farms and the creation of many private farms that became unviable (IVASK, 1997).

In the euphoria of the moves towards independence, it was estimated that there would be 40,000-60,000 private farms in Estonia by 2000 (UNWIN, 1997). This proved true as the number of agricultural households[1] increased to 55.7 thousand by 2001, with

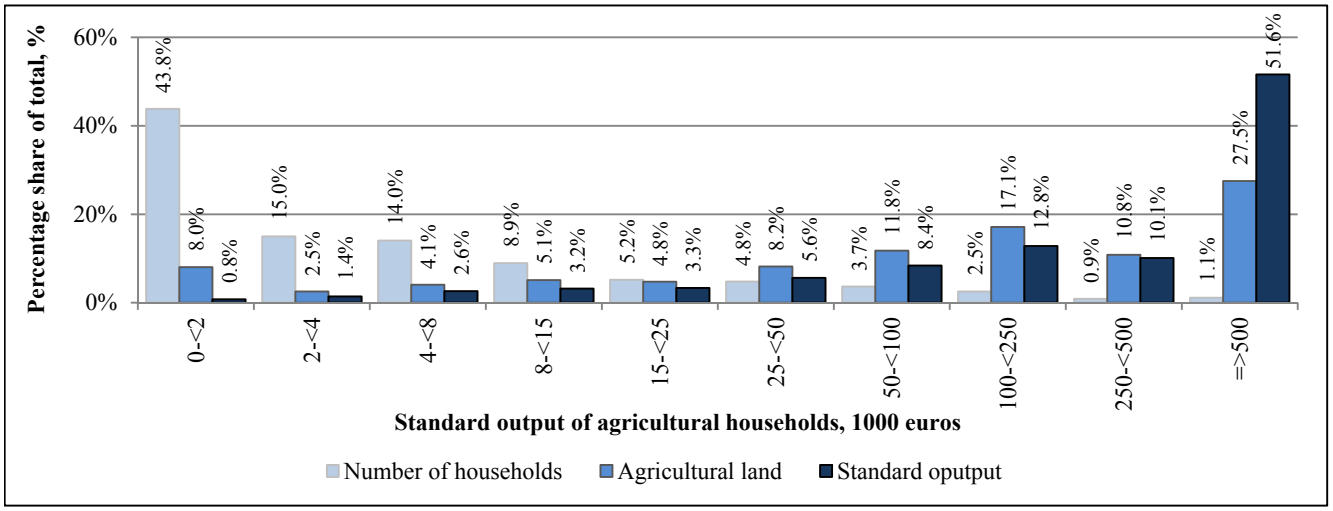
[1] Due to the fact that the definitions of agricultural holdings have changed several times in 1989-2010, we have used agricultural household as a synonym of farm. Here, household plots are not accounted as agricultural households. In 1989 collective farms and private farms are considered as agricultural households. From 1991-1999 agricultural enterprises and private farms were considered as agricultural households. Agricultural enterprise was defined as a legal person whose main activity according to the Estonian Business Register is agriculture. Private farm was defined as a holding with more than 1 ha of agricultural or forest land (STATISTICS ESTONIA, 2002). Since 2001 agricultural holdings were considered as agricultural households. Agricultural holding is defined as a single unit both technically and economically, which has single management and which produces agricultural products or maintains its land which is no longer used for production purposes in good agricultural and

Figure 1. Number of agricultural households and agricultural employment in Estonia in 1989-2010



Source: STATISTICS ESTONIA (2012)

Figure 2. Distribution of agricultural households, agricultural land and standard output in Estonia in 2010



Source: STATISTICS ESTONIA (2012)

an average of 16 ha of agricultural land per household (Figure 1). Agrarian restructuring and the creation of private farms led to a situation where, in 2001, the number of people employed in agriculture, hunting and related service activities was 28.8 thousand, while the number of agricultural households was two times higher. Evidently, many of the 55.7 thousand agricultural households were unable to provide full-time employment for at least one household member. By 2010, compared to 2001, the number of agricultural households had decreased by 64.8% to 19,600 with an average of 48 ha of agricultural land each, and agricultural employment had decreased to 17.2 thousand persons.

However, the size distribution of agricultural households remains skewed: in 43.8% of the households, the standard output (SO) was less than 2,000 euros in 2010[2]. These households managed 8.0% of agricultural land and produced 0.8% of the total SO (Figure 2). At the same time, in 1.1% of the house-

environmental condition, where there is at least 1 ha of utilised agricultural land, or there is less than 1 ha of utilised agricultural land but agricultural products are produced mainly for sale. Units where agricultural products are not produced but only land is maintained in good agricultural and environmental condition are included from 2007 (STATISTICS ESTONIA, 2012).

[2] In the agricultural census, economic size of agricultural households is estimated. From 2010 economic size of the holding is measured as standard output of the holding. Standard output is defined as the monetary value of gross agricultural production at farm-gate price corresponding to the average situation in a given region which is calculated on the basis of crop area, number of livestock and standard output coefficients. Standard output does not include VAT, other taxes on products and direct payments (STATISTICS ESTONIA, 2012; COMMISSION REGULATION (EC) NO 1242/2008).

holds SO was at least 500,000 euros. This 1.1% of households managed 27.5% of agricultural land and produced 51.6% of the total SO. In 2011, 946 thousand ha of agricultural land was utilised in Estonia. In 1991, the utilised agricultural area was 1,375 thousand ha and the area of arable land was 1,116 ha, implying that approximately 200-400 thousand ha of agricultural land has been left idle in transition. In 2011, the share of the agricultural sector in value added was 3.6% and in employment 3.2%. The value of Estonian agricultural output was 810.6 million euros in 2011, of which arable products comprised 41.5% (cereals 15.5%, oilseeds 7.7%, fodder 7.9%) and animal products 47.8% (milk 26.0%, pork, 10.7%, cattle excl. milk 5.3%) (STATISTICS ESTONIA, 2012).

Therefore, due to the context of transition, the development of Estonian farm structures in the past 25 years differs from the traditional development of the family farm based structure in western countries, as described by e.g. TAYLOR et al. (1998), PESQUIN (1999), ERRINGTON (2002), CALUS et al (2008). In the beginning of the period, the number of farms increased rapidly due to the processes of transition, restitution and privatisation, while the relative uncertainties about the stability of economic conditions coupled with the fast development of other economic sectors have contributed to the decline in the number of farms (VIIRA et al., 2009a). Since the newly established farms were not taken over from the preceding generation, this process cannot be characterised as smooth intra-family farm successions. Growing up on a farm and socialisation within a farm family are regarded as specific investments in human and social capital, which can be seen as a transaction specific investment and the accumulation of attitudes and skills that are adjusted to the specifics of decision making in individual family farm units (HUFFMANN, 1977; PESQUIN et al., 1999; GLAUBEN et al., 2004b). As a large proportion of farms were returned to the heirs of the pre-war owners, many new owners lacked the human and financial capital necessary for managing an individual farm. HEDIN (2005) found that non-monetary values like the desire to recover family property and the sense of duty towards ancestors were important factors for new landowners, and in many cases economic motives for the recovery of land were of minor importance.

The decrease in the number of farms and the increase in average farm size from 2001 to 2010 imply that farm growth, decline or exit could be observed in many cases. In Estonia, the rapid decline in the number of farms has raised questions if the chosen paths of agricultural and ownership reforms were correct, and if the agricultural policy has been preferential for larger farms. Taking into account the context of changes since 1991-2010, we assume that in addition to economic and socioeconomic factors, farm growth, decline and exits have also been affected by transition-specific factors, such as in the way the farm was established (e.g. restitution of pre-war farm, privatisation of part of collective farm etc.) or participation in semi-subsistence farming schemes in new EU member states. Given the large decrease in the number of agricultural households, we expect that a large portion of the households that have exited the agricultural sector were restituted farms. However, in recent years, the decline in the number of farms has slowed down (Figure 1). Hence, one generation after the beginning of the transition, it is intriguing to study if the process of structural changes is driven by similar factors as in other western countries or still exhibits the characteristics of post-communist transition.

Therefore, the aim of this paper is to study the effects of various farmer- and farm-specific characteristics on the probability of farm growth, decline and exits relative to retaining the previous farm size. The factors under consideration are: the age of the farm operator, farm size measured by the value of the farm's standard output, off-farm employment status of the farm operator, farm operator's evaluation on the availability of successors, and his/her level of formal education. Also, the effects of the farm specialisation (grazing livestock), the way the farm was established (restitution), and participation in semi-subsistence farming scheme are analysed. We use multinomial logit regression and farm survey data from 2007 and 2011, which is combined with the 2006 and 2010 data from the national paying agency's registries about land use, animal stock and farm payments.

2 Factors that Affect Farm Growth, Decline and Exit

BOEHLJE (1990) categorises five models of structural change: the technology, human capital, financial, institutional, and sociological (family farm) model. In our analysis, we mainly draw on the sociological and human capital models, as these are closely related to the family farm life cycle and farm family characteristics.

Numerous studies suggest that the age of the farm operator is one of the main factors in farm

growth and survival (WEISS, 1999; VÄRE, 2006; PEERLINGS and OOMS, 2008; SCHNICKE et al., 2008). In the entry stage, the farm operator has to acquire a "critical mass" of managerial ability and the capital necessary for growth. In the exit stage, the farm operator is interested in reducing his/her commitment (BOEHLJE, 1990). This implies that farm growth is less likely in the younger and older age groups of farm operators. In addition, the effect of age is interrelated with the availability of successors. If the farm is transferred within the family, its viability is optimised prior to succession. In the case of farm exit, liquidation value is optimised. The succession effect plays a role from the age of 45 and the early designation of the successor motivates the farmer to invest and improve the management of the farm (GLAUBEN et al., 2002; CALUS and VAN HUYLENBROECK, 2008; CALUS et al., 2008; VÄRE, 2006).

Human capital, i.e. level of education, managerial ability, experience and skills, has been noted as an important factor in farm growth. Managerial input is also critical to the cost and production relationships of a farm. If managerial capacity is a fixed factor, then costs will eventually rise with increased farm size, since higher levels of output receive less and less managerial input (BOEHLJE, 1990).

RIZOV (2003) has suggested that the analytical background of JOVANOVIC's (1982) model, in which individuals are unsure of their abilities when they enter business but uncover their true efficiencies over time, is appropriate to explain the farm-sector transformation in former communist countries as many individuals established private farms without knowing if they have what it took to become an entrepreneur. In the study of the role of human capital in the decisions of rural households regarding the selection of the farming mode (cooperative, full-time individual farm, part-time individual farm, hybrid, or absentee landowner) in Romania, RIZOV (2005) found that, while the farm type selection process was complicated by the factor of market imperfections characterising transition, households with a higher level of human capital (education, broader work experience) were more likely to opt for either full- or part-time individual farming, or selected absentee landowner type and rented out land, while deriving income from off-farm work. Therefore, higher human capital can be associated with the more effective management of individual farms and better opportunities in the off-farm labour market. Households with lower human capital were more likely to select a cooperative type of farming.

Also, it has been argued that human capital may increase the earning capacity of a farm operator in the non-farm economy, therefore reducing the probability of farm survival if the farm operator chooses to dedicate 100% of his/her labour input outside the farm (WEISS, 1999); or increasing the probability of farm survival if only part of the labour input is used off-farm, and the off-farm income complements earnings from agricultural production (BREUSTEDT and GLAUBEN, 2007; BOEHLJE, 1990). Off-farm employment has more of an impact on the farming sector in areas where there are more non-farm employment opportunities (BOEHLJE, 1990), and also in the younger age group of farmers who can benefit more from the change in their careers due to the longer time horizon (RIZOV and MATHIJS, 2003).

Gibrat's Law implies that farm growth is independent of the initial farm size. However, WEISS (1999) shows that smaller farms grow relatively faster than larger farms. Several studies have reported a negative relationship between farm size and farm exits. More land makes it easier to overcome borrowing constraints and therefore reduces development restrictions and increases succession probability (GLAUBEN et al., 2004a; BREUSTEDT and GLAUBEN, 2007). According to the financial model of structural changes, agricultural land is one of the main production factors that determine farm income. Simultaneously, land constitutes a major part of farm capital. If capital gains from land are foreseen, the farmer is expected to obtain more agricultural land to increase the farm's future value (BOEHLJE, 1990). In Estonia, the average level of direct payments per ha of agricultural land is one of the lowest in the EU; however, the payments have been increasing since 2004 and are expected to converge towards average EU levels in the future (EUROPEAN COMMISSION, 2011). Therefore, in Estonia, the expected future capital gains from agricultural land have been and will continue to be a strong motivator for farm expansions.

The technology model of structural changes mainly deals with the adaptation of technology and scale economies. Primarily, the interest lies in the long-run cost curve and factors that affect the curve, among which agricultural policy is often of interest (BOEHLJE, 1990). In this paper, we analyse the effects of the semi-subsistence farming scheme on farm growth, decline and exit probabilities. Subsistence farming is often associated with rural poverty, or lifestyle and consumption preferences. Semi-subsistence farms normally produce for their own needs but also

sell to local markets. The semi-subsistence farming measure was a transitional measure for supporting semi-subsistence farms in the new EU member states that were undergoing restructuring (DAVIDOVA et al., 2009). The semi-subsistence farming scheme was one of the payment schemes in the 2004-2006 Estonian Rural Development Plan. Participation in the scheme provided farmers with an annual flat rate payment of 1,000 euros for five years. The aim of the scheme was to maintain smaller agricultural holdings and enhance their survival. Farmers were obliged to continue with agricultural activities for five years and increase the revenues from agricultural production (EMA, 2005).

In addition to the semi-subsistence farming payment, semi-subsistence farms were eligible also for single area payment, other types of direct payments and rural development support measures. In 2006, 16.1% of all the recipients of farm subsidies in Estonia received semi-subsistence payments. Of the 3,217 semi-subsistence farms 16.3% received only semi-subsistence payment and 83.7% received also other farm payments. The average area of these semi-subsistence farms that received other farm payments was 36.9 ha, and average SO 15,173 euros, their average level of all farm payments was 205 euro/ha and farm payments comprised 56% of their total SO. In case of the farms that did not receive semi-subsistence payments, the average area was 47.8 ha, the average SO was 24,548, the average level of all farm payments was 95 euro/ha and farm payments comprised 37% of their total SO. Therefore, the semi-subsistence farms had considerably higher average level of subsidies. However, the uptake of the measure in Estonia was lower than in other new EU member states. One of the reasons for relatively low participation was the requirement to continue agricultural activities in the next 5 years. Given the rapid decline in the number of agricultural households in Estonia between 2003 and 2010 (Figure 1), it is likely that those agricultural households that were unsure about continuation of farming, did not sign the contract for the next 5 years.

Farm survival is also influenced by the type of activities undertaken. A high share of animal production indicates relatively high sunk costs in closing down the farm. BREUSTEDT and GLAUBEN (2007) found that in regions specialised in livestock production the loss in the number of farms was significantly smaller. In our sample, specialist grazing livestock (in the following we use 'grazing livestock' for abbreviation of this farm type) was the most frequent farm type (Table 2). In this farm type, the SO of grazing livestock (i.e. equidae, all types of cattle, sheep and goats) and forage for grazing livestock constitute more than 2/3 of farm SO (COMMISSION REGULATION (EC) NO 1242/2008). Substantial structural changes have occurred in this farm type in recent years in Estonia. In 2004, there were 2,146 milk quota owners in Estonia; in 2012, 918 quota owners remained. Hence, in 8 years, 57.2% of the milk producers had quit milk production (ARIB, 2005). Also, in 2006-2010, the number of grazing livestock farms in the registries of the paying agency decreased by 5.3%, while the total number of farms in the registries declined 2.9%. Therefore, it was analysed whether specialising in grazing livestock had an effect on farm growth, decline and exit probabilities.

3 Data and Method

The data was obtained from two farm surveys conducted in December 2007 and March 2011. The survey of 2007 aimed to investigate the perspectives and intentions of Estonian agricultural producers in the upcoming three years (2008-2010) (VIIRA et al., 2009b). The questionnaire was posted to a random sample of 1,000 farmers from the population of 6,724 farms whose economic size exceeded 2 ESU in 2005. In total, 290 questionnaires were returned (response rate 29%). In 2011, the survey was repeated among the respondents of the previous survey. Of the 290 posted questionnaires, 228 were returned (response rate 78.6%). The structure of the questionnaire was similar to that used in 2007. In addition, farmers were asked if they had quit agricultural production in 2008-2010. Since all of the respondents did not answer all the questions, data from 196 respondents is used in the present analysis.

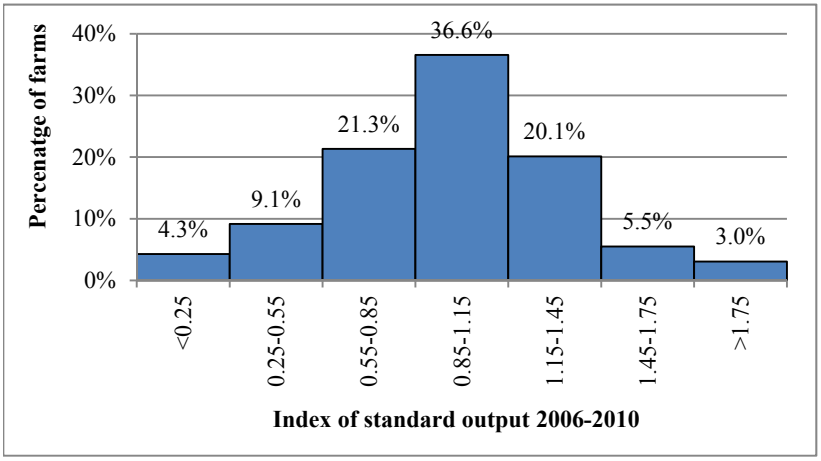
The survey data was complemented with data from the registries of the paying agency (ARIB – Estonian Agricultural Registers and Information Board) regarding land use, crops, agricultural animals, and participation in payment schemes. Based on the registry data of 2006 and 2010, SO as defined in the COMMISSION REGULATION (EC) NO 1242/2008 were calculated for each farm, based on Estonian SO coefficients used in 2011 (RURAL ECONOMY RESEARCH CENTRE, 2012). The derived SO of 2006 and 2010 were used in order to measure the economic size of the farms in 2006, and estimate changes in the farm's economic size between 2006 and 2010. Among those 164 farms that did not quit agricultural production between 2006 and 2010, the average SO in 2006 was 71,034 euros, and 80,305 euros in 2010. This indicates

that the average economic size of the remaining farms increased by 13.1%. In 2006, the average SO of those farms that quit agricultural agricultural production between 2006 and 2010 was 11,836 euros.

Previous studies have investigated the effects of various determinants on the probability of farm growth or decline based on stated intentions (BARTOLINI and VIAGGI, 2012), or on empirical growth rates (RIZOV and MATHIJS, 2003; PEERLINGS and OOMS, 2008; BAKUCS and FERTŐ, 2009). Based on empirical data from 2007 and 2011, we aim to study the effects of various factors on the probability of farm exit, decline and growth, relative to retaining farm size. Since the SO in farming may vary from year-to-year depending on crop rotations, calving or culling rates and timing, diseases, etc., it is reasonable to assume that the variation of SO within a specific range should be considered as relative stability rather than farm growth or exit. However, there is no empirically correct threshold for growth or decline rates.

Based on the percentiles of changes in the SO (Table 1) and an average of 13.1% growth in SO in 164 remaining farms (32 farms exited between 2006 and 2010), a 15% growth and decline threshold was considered appropriate for the analysis. Hence, if a farm's SO in 2010 was less than 85% of its SO in 2006, the farm size was considered to be decreasing. Therefore, of the 164 farms that retained agricultural production, 34.8% (Figure 3), and in the whole sample of 196 farms 29.1%, were deemed to be decreasing. If the farm's SO in 2010 exceeded 115% of the respective value in 2006, the farm was considered to be increasing (28.7% of farms that retained agricultural production and 24.0% of the farms in the whole sample). If the SO in 2010 was in the range of 85-115% compared to the value in 2006, the farm size was considered to be stable (36.6% of farms that retained agricultural production and 30.6% of the farms in the whole sample). The farms for which the farm operator declared that the farm has ceased agricultural production, or which the SO was zero in 2010, were considered to be those that have exited from farming (16.3% of the whole sample).

Figure 3. Distribution of farms that retained agricultural production according to the changes in the standard outputs in 2006-2010 (N=164)



Source: own calculations

Table 1. Percentiles of farms that retained agricultural production according to the changes in the standard outputs in 2006-2010 (N=164)

Percentile	N	Range (index of standard output)	Average standard output in 2006, euros	Average area in 2006, ha
0.1	17	0.069-0.509	21,352	38.0
0.2	16	0.509-0.686	13,256	33.8
0.3	16	0.686-0.799	13,586	28.5
0.4	17	0.799-0.890	147,681	231.9
0.5	16	0.890-0.953	54,416	97.6
0.6	16	0.953-1.010	74,297	153.2
0.7	17	1.010-1.124	31,160	87.2
0.8	16	1.124-1.233	88,490	292.4
0.9	16	1.233-1.364	156,739	278.4
1.0	17	1.364-9.532	107,863	101.7

Source: own calculations

The definitions and descriptive statistics of dependent and independent variables are given in Table 2. Multinomial logit regression was used to estimate the effects of the explanatory variables on the probability of farm exit, decline and growth relative to the base situation, which here is retaining the farm's economic size in the range of 85-115% of the respective figure in 2006. The multinomial logit regression model was specified as:

$$(1)\quad \text{Logit}(\text{development}_{j|\text{stable}}) = \alpha_0+\alpha_{1jk}\text{age}+\alpha_{2jl}\text{size}+\alpha_{3j}\text{off\_farm}+\alpha_{4j}\text{semisubs}+\alpha_{5j}\text{education}+\alpha_{6j}\text{successors}+\alpha_{7j}\text{restituted}+\alpha_{8j}\text{gr\_livestock}+\varepsilon_j.$$

Table 2. Definition and descriptive statistics of variables

Variable	Definition	Scale/measurement	Obs	Mean	Std. dev.	Min	Max
Dependent variable							
Development	Exit or change in farm standard output (SO) in 2006-2010	0=stable (2010 SO 85-115% of 2006 SO) 1=exit from farming 2=decreasing (2010 SO <85% of 2006 SO) 3=increasing (2010 SO >115% of 2006 SO)	60 32 57 47				
Explanatory variables							
Age	Age of the farm operator in 2007	<40 years 40-49 years 50-59 years ≥60 years	16 38 66 76	35.0 44.9 54.3 68.7	4.2 2.9 2.9 5.8	25 40 50 60	39 49 59 85
Size	Farm size measured in 2006 SO (thousand euros)	1st quartile 2nd quartile 3rd quartile 4th quartile	49 49 49 49	4.4 10.0 21.0 210.1	1.8 1.6 5.8 329.9	0.4 7.7 13.4 31.6	7.7 13.4 31.6 1458.6
Off_farm	The farm operator has an off-farm job.	0=no, 1=yes	196	0.24	0.43	0	1
Semisubs	The farm is participating in the semi-subsistence farming scheme.	0=no, 1=yes	196	0.45	0.50	0	1
Education	Farm operator's level of education	1=basic education 2=secondary education 3=vocational education 4=higher education	196	2.79	1.00	1	4
Successors	Farm operator's evaluation on the availability of successors	1-very poor, 2-poor, 3-adequate, 4-good, 5-very good	196	2.37	1.08	1	5
Restituted	The farm was established on the basis of restituted land.	0=no, 1=yes	196	0.59	0.49	0	1
Gr_livestock	Farm is specialised in grazing livestock.	0=no, 1=yes	196	0.52	0.50	0	1

Source: own calculations based on survey data from 2007 and 2011, and paying agency data from 2006 and 2010.

From the model specification in equation (1), *development*$_j$ are the probabilities of farm exit, decline or growth relative to retaining the farm's economic size (stable) within the chosen boundaries (85-115%). The α_j are the parameters to be estimated simultaneously for the three regression equations represented by equation (1), and ε_j are the corresponding residual terms.

The variable *Age* measures the age of the farm operator. In 2006, the average age of the respondents was 56.5 years. In the empirical estimation, the variable is categorised into four (*k*) groups of <40, 40-49, 50-59 and ≥60 years and the group of ≥60 years is used as the basis for comparisons. The variable *Size* is classified into 4 (*l*) quartiles according to the SO of farms in 2006. The first three quartiles are used as dummy variables in the empirical estimation and the fourth quartile is a basis for comparisons. In the first size quartile, the farm SO ranges from 360 to 7,652 euros, in the second quartile the SO range is 7,652-13,358 euros, and in the third quartile 13,358-31,634 euros. In the fourth quartile, the values of farm SO are between 31,634 and 1,458,626 euros.

Off_farm is a dummy variable that represents whether the farm operator has an off-farm job in addition to the work in the farm. 24% of the respondents declared having an off-farm job. The dummy variable *Semisubs* indicates whether the farm was participating in the semi-subsistence farming scheme in 2006. 45% of the respondents participated in the scheme. *Education* describes the level of formal education of the farm operator and is a proxy for human capital. The variable is scaled increasingly starting from the value 1 (basic education) to 4 (higher education). This variable is assumed to be roughly continuous. The variable

Successors describes the farm operator's subjective evaluation about the availability of successors for farm transfer in the Likert scale from 1 (very poor) to 5 (very good), and is assumed to be roughly continuous. The mean of the given evaluations was 2.37, indicating that most of the farmers do not consider farm transfer to a successor likely. 59.7% of the farm operators evaluated the availability of successors as 'very poor' or 'poor', and just 16.3% of the respondents evaluated the availability of successors as 'good' or 'very good'.

The dummy variable *Restituted* indicates whether the farm was established at the beginning of transition on the basis of restituted land or founded in some other way. In our sample, 14 farms (7.1%) were established as a result of the privatisation of a functioning previous collective farm or part of the collective farm, 56 farms (28.6%) were established as private farms on rented, privatised or bought land[3], 11 farms (5.6%) were bought from other farmers, and 115 farms (58.7%) were established on the basis of restituted land or farmsteads.

Gr_livestock is a dummy variable that indicates whether the farm was specialised in grazing livestock (milk, beef, sheep or goats) in 2006. In the sample, 52.0% of the respondents belonged to the *Gr_livestock* farm type, 30.6% of the respondents were specialised in arable production, 16.8% were farms with mixed activities and 1 farm was specialised in horticulture.

4 Results and Discussion

The estimates of the specified model (1) are given in Table 3. Next, the estimated effects of explanatory variables are discussed.

Table 3. The results of multinomial logit estimates

Variable	1=exit from farming	2=decrease of standard output>15%	3=growth of standard output>15%
Intercept	1.076 (1.865)	0.284 (1.129)	-2.273 (1.319)*
Age<40	-1.222 (1.406)	-1.001 (0.828)	0.464 (0.804)
Age 40-49	-1.521 (0.951)	-0.929 (0.635)	1.238 (0.644)*
Age 50-59	-1.274 (0.691)*	-0.759 (0.487)	0.441 (0.589)
Successors	-1.095 (0.350)***	-0.236 (0.199)	0.263 (0.207)
Farm size 1st quartile	2.936 (1.265)**	1.562 (0.697)**	1.039 (0.734)
Farm size 2nd quartile	1.881 (1.278)	1.119 (0.644)*	0.250 (0.664)
Farm size 3rd quartile	1.239 (1.382)	1.579 (0.630)**	0.903 (0.600)
Off_farm	1.568 (0.698)**	0.293 (0.523)	-0.287 (0.566)
Semisubs	-1.862 (0.658)***	-0.321 (0.431)	-0.562 (0.469)
Education	-0.056 (0.293)	-0.019 (0.215)	0.471 (0.263)*
Restituted	0.364 (0.625)	-0.700 (0.422)*	-1.052 (0.440)**
Gr_livestock	-1.160 (0.642)*	0.364 (0.420)	-0.367 (0.448)
McFadden pseudo R^2		0.223	
Log likelihood		-207.044	
Number of observations		196	

Figures in parentheses are standard errors.
*significant at 0.1 level; **significant at 0.05 level; ***significant at 0.01 level
Source: own calculations

4.1 Farm Life Cycle

In this paper, we use the age of the farm operator and the farm operator's evaluation on the availability of successors as the variables related to the farm life cycle. The estimates of the model confirm the relevance of the farm life cycle on farm growth, decline and exit. From Table 3, it appears that the probability of exiting from farming is lower in younger age groups compared to the farm operators in the age group ≥60 years. The difference is significant at the 0.1 level in the 50-59 year age group. The signs of regression coefficients indicate that the probability of farm size decline is also lower in younger age groups. However, these coefficients are not statistically significant. It appears that the probability of farm growth is significantly higher if the farm operator is 40-49 years old. In the age groups <40 years and 50-59 years, the farm growth probability did not differ significantly

[3] There were several ways in which a private farm could have been established. In 1988 a regulation was adopted for the allocation of the marginal land of collective farms to private farms, as well as selling of agricultural machinery to private farms (EMA, 2002). The Farm Law of 1989 envisaged, in addition to hereditary (based on pre-collectivisation farms), establishment of new tenant farms. In order to address the social equity concern (SWINNEN, 1999), the Estonian Land Reform Act of 1991 enacted the privatisation of land by pre-emptive rights (for people whose buildings were located on land subject to privatisation) or on general grounds (for rural inhabitants in the vicinity of their homes) (EMA, 2002).

compared to age group ≥60 years. This is in line with BOEHLJE's (1990) suggestion that the farm operator first needs to acquire a "critical mass" of capital and managerial ability before farm extension, and it supports the findings of GLAUBEN et al. (2002), CALUS and VAN HUYLENBROECK (2008), CALUS et al. (2008), VÄRE (2006) that the succession effect plays a role from the age of 45, and the early designation of the successor motivates the farmer to invest and improve the management of the farm.

Our results confirm the results of earlier studies (WEISS, 1999; CALUS and VAN HUYLENBROECK, 2008; POTTER and LOBLEY, 1992) about the significance of the availability of successors on farm survival prospects. From Table 3, it appears that if the availability of successors (in the farmer's opinion) is good, the probability of farm exit is significantly lower. However, the results do not indicate whether the farmer's subjective evaluation about the availability of successors have a significant influence on the probabilities of farm decline and growth.

4.2 Human Capital

Human capital is a crucial factor in economic development, both at micro and macro levels. As proxies of human capital, we use the farm operator's formal level of education and the farm operator's off-farm job status. RIZOV and MATHIJS (2003) suggest that farms with managers possessing greater stocks of human capital should be more efficient, and therefore should survive and grow relatively faster. Our results show that the farm operator's level of education has a moderately significant (at 0.1 level) positive effect on the probability of farm growth. With respect to the probability of farm decline and exit, the effect of education was insignificant (Table 3). The positive effect of level of education on farm growth probability implies that for new entrants and those young farmers who have taken over the family farm, supportive educational and advisory system would increase farm growth and survival probabilities.

In our sample, the farm operator's level of education had a significant effect on the probability of having an off-farm job, confirming the argument that human capital may increase the earning capacity of a farm operator in the non-farm economy.[4] In addition, the probability of having an off-farm job was significantly higher in the case of younger farm operators and smaller farms. The average of the *Education* variable of those farm operators that had an off farm job was 3.04, compared to 2.70 in the farms where the farmer did not have an off-farm job. The average age of farm operators that had an off-farm job was 52.6 years, compared to 57.7 years of those operators who did not have an off-farm job. The average area of the farms where the farm operator had an off-farm job was 93.4 ha, compared to 124.1 ha if the farm operator did not have an off-farm job. The estimates of model (1) indicate that in Estonia, having an off-farm job has a positive effect on the probability of farm exits. With regard to the probabilities of farm decline or growth, the effect of having an off-farm was insignificant. Therefore, our results indicate that in Estonia it is more likely that an off-farm job reduces rather than increases the probability of farm survival.

4.3 Size and Specialisation

In our analysis, farm SO was used as a measure of farm size. In Estonia, where the farm size structure is dualistic, it is often argued that larger farms have better preconditions for competition and growth. Our results indicate that farm size has a significant negative effect on farm exit probability in the 1st size quartile and on decline probabilities in the first three size quartiles. The small farms in the 1st quartile of SO had a significantly ($p<0.05$) higher probability of exiting from farming compared to farms in the 4th quartile. In the case of farm decline, the first three size groups (quartiles) had a significantly higher probability to decline compared to large farms in the 4th quartile. At the same time, farm size did not have a significant effect on the probability of farm growth. This is in accordance with the findings of WEISS (1999), RIZOV and MATHIJS (2003) who suggested that larger farms tend to exhibit lower growth and decline rates. However, it also suggests that in the case of dualistic size structures the results of the analysis would benefit if the sample of very large farms were studied separately from the sample of smaller farms.

As a measure of farm specialisation, a dummy variable *Gr_livestock* was used, indicating if the farm was specialised in grazing livestock in 2006. The results in Table 3 demonstrate that the farms specialised in grazing livestock have a significantly ($p<0.1$) lower probability to exit from farming. This result is in line with BREUSTEDT and GLAUBEN (2007), who found that in regions specialised in livestock production the loss in the number of farms was significantly smaller.

[4] The results of the respective binary logit regression are not reporter here.

4.4 Semi-subsistence Farming and Way of Establishment of the Farm

DAVIDOVA (2011) has suggested that the CAP has to help semi-subsistence farms to commercialise or exit. Our results indicate that participation in the semi-subsistence farming scheme in 2006 did not have a significant effect on the probabilities of farm growth (which could be considered as a proxy for commercialisation) and farm decline (Table 3). However, participation in the semi-subsistence farming scheme significantly decreased the probability of farm exit. Nevertheless, our results do not confirm its effect on farm growth (commercialisation), which was one of the aims of the scheme. The results may also be influenced by the fact that the ending point of the considered period was also the ending point of a large part of the five-year contracts of the scheme. Therefore, in the following years, the negative effect of the scheme on the exit probability of smaller farms may diminish. Our results confirm the suggestion of DAVIDOVA et al. (2009) that subsistence production could be favoured by households with non-farm income or retired households who wish to satisfy lifestyle and consumption preferences. In the survey, farmers were asked to position their farming related values in the Likert scale of 1 to 5 between two extremes: 'profit is more important than farming as a lifestyle' (1) and 'farming as a lifestyle is more important than profit' (5). The average of this variable was 4.0 in the case of semi-subsistence farmers and 3.5 in the case of farmers that did not participate in the scheme. In the cases where farm operators have lifestyle and consumption preferences, it is also probable that the farms will remain in business, but will decrease in size as the farm operator gets older. However, the results indicate that through decreasing the farm exit probability, such payment schemes are slowing down the process of structural changes.

In the Estonian land, agricultural and ownership reforms in the early 1990s, it was decided that the pre-war farms and farmland should be returned to the heirs of the dispossessed owners. GLAUBEN et al. (2004a) found that farms that have been run by the same family for several generations show a higher probability of being transferred within the same family. Our results indicate that the farms that were founded based on returned land or farmsteads are on average smaller (64.0 ha compared to 191.6 ha if the farm was established via privatisation or bought), and they have significantly lower growth and decline probabilities. At the same time, such farms do not have a higher probability to exit. Also, the operators of restituted farms value farming as a lifestyle more highly than other farmers. The average of this variable was 4.0 in the case of restituted farms and 3.4 in the case of other farms. This confirms the suggestion of HEDIN (2005) that the operators of such farms consider it important to maintain the farms of their forefathers.

5 Conclusions

In this paper, we analyse the effects of some socioeconomic and transition-specific factors on the probability of farm growth, decline and exit. Survey data from 2007 and 2011 is combined with data from the registries of the national paying agency. Farm growth and decline rates are calculated based on standard outputs. We consider 15% thresholds, both for farm growth and decline. Farm exits are determined based on the responses of farm operators in 2011 and SO in 2010. Multinomial Logit regression is used in order to estimate the model.

The results indicate that the farm growth probability is highest in the 40-49 year age group. Compared to the age group of ≥60 years, farm operators in younger age groups have a lower probability to exit or decline. The availability of successors has a significant negative effect on farm exit probability. This is in line with previous findings regarding the farm life cycle and succession effect (CALUS et al., 2008; WEISS, 1999). We also show that the level of education of the farm operator is positively affecting farm growth probability. The positive effect of education on farm growth probability implies that for young farmers a supportive educational and advisory system would increase farm growth and survival probabilities. In addition, our data confirmed the positive relationship between education and working off-farm as suggested by BOEHLJE (1990). Off-farm work is more probable in smaller farms and in cases of younger and better educated farm managers, and it is increasing the probability of exiting from farming. Grazing livestock farms were shown to have a significantly lower probability to exit from farming.

Our results indicate that the semi-subsistence farming scheme slowed down the process of structural changes in regard to smaller farms. The farms that participated in the semi-subsistence farming scheme had a lower probability to exit in the considered period (2006-2010). However, the semi-subsistence farming scheme did not have a significant effect on the probability of farm growth or decline. It is likely that

the effects of the semi-subsistence farming scheme will begin to diminish now that it has completed.

In most western countries, the prevailing farm ownership and management type is the family farm that is handed down from one generation to the next. In Estonia, such succession patterns are not well developed due to the structural breaks of the past 100 years. Nevertheless, our results suggest that farms that were established based on returned land or farmsteads do exhibit lower decline and growth probabilities, and they are more inclined to retain the farm size. This implies that the continuity of the ownership and respect for forefather's work is a factor that influences the process of structural changes.

While participation in the semi-subsistence farming scheme reduces the exit probability, and the fact that a farm has been founded on the basis of restituted land or farmstead reduces farm growth and decline probability, the effects of other factors imply that the process of structural changes in Estonian agriculture today is largely following the same pattern as in other western countries. Farm growth is more likely in the case of middle-aged (40-49 years) and better educated farm operators; farm decline is more likely in the case of smaller farms. Exit from farming is more likely if the farm operator's age is 60 years or more, if the farm is very small (1st quartile of SO), or if the farm operator has an off-farm job, and it is less likely if the farm is a grazing livestock farm.

Today, the structure of Estonian agricultural producers is polarised – there are a large number of small producers that cultivate a relatively small proportion of land, and a relatively small number of larger agricultural producers that cultivate most of the agricultural land. The tendency towards a dualistic farm structure was also suggested by UNWIN (1997): "If Estonia is indeed to move to a position of economic convergence by which it will be able to join the EU, its agrarian economy will have to undergo further substantial changes. Ironically, this may well lead to a landholding structure much more reminiscent of the 1,000 collective farms that existed in 1952 or the ca. 1,000 large landed estates liquidated by the 1919 Land Reform, than of the numerous small private farms existing in the 1930s or the estimates of perhaps 60,000 private farms by the end of the 1990s that were being suggested at the beginning of the decade." Our results show that larger farms have a higher probability to remain in business, and they have a lower probability to exit or decline. At the same time, larger farms do not have higher probability to grow. In addition to the fact that the farm size structure is dualistic, the findings of PÕDER et al. (2011) suggest that the values of the operators of large and small farms also tend to be polarised. This implies that in regard to dualistic farm structures, the future analyses of farm growth, decline and exit would benefit if the effects were studied separately in farm size groups.

References

ARIB (Estonian Agricultural Registers and Information Board) (2012): Milk quota (Piimakvoot). In: http://www.pria.ee/et/toetused/valdkond/turukorraldus/piimakvoot/.

BAKUCS, L.Z. and I. FERTŐ (2009): The growth of family farms in Hungary. In: Agricultural Economics 40 (supplement): 789-795.

BARTOLINI, F. and D. VIAGGI (2012): The common agricultural policy and the determinants of changes in EU farm size. In: Land Use Policy (article in press).

BOEHLJE, M. (1973): The entry-growth-exit processes in agriculture. In: Southern Journal of Agricultural Economics 5 (1): 23-36.

– (1990): Alternative models of structure change in agriculture and related industries. Staff Paper Series, Staff Paper P90-41. Department of Agricultural and Applied Economics, University of Minnesota, St. Paul, MN, USA.

BREUSTEDT, G. and T. GLAUBEN (2007): Driving Forces behind Exiting from Farming in Western Europe. In: Journal of Agricultural Economics 58 (1): 115-127.

CALUS, M. and G. VAN HUYLENBROECK (2008): The succession effect within management decisions of family farms. Proceedings of the XIIth EAAE Congress 'People, food and environments: Global trends and EU strategies', 26-29 August 2008, Ghent, Belgium.

CALUS, M., G. VAN HUYLENBROECK and D. VAN LIERDE (2008): The relationship between farm succession and farm assets on Belgian Farms. In: Sociologia Ruralis 48 (1): 38-56.

COMMISSION REGULATION (EC) No 1242/2008 of 8 December 2008 establishing a community typology for agricultural holdings.

CSAKI, C. and Z. LERMAN (1994): Land reform and farm sector restructuring in the former socialist countries in Europe. In: European Review of Agricultural Economics 21 (3-4): 553-576.

DAVIDOVA, S. (2011): Semi-Subsistence Farming: An Elusive Concept Posing Thorny Policy Questions. In: Journal of Agricultural Economics 63 (3): 503-524.

DAVIDOVA, S., L. FREDRIKSSON and A. BAILEY (2009): Subsistence and semi-subsistence farming in selected EU new member states. In: Agricultural Economics 40 (S1): 733-744.

EMA (Estonian Ministry of Agriculture) (2005): Estonian Rural Development Plan 2004-2006. In: http://www.agri.ee/public/juurkataloog/TRUKISED/s_raamat_eng_01.pdf.

– (2002): Estonian Agriculture, Rural Economy and Food Industry. Tallinn.

ERRINGTON, A. (2002): Handing Over the Reins: A Comparative Study of Intergenerational Farm Transfers in England, France and Canada. In: Proceedings of the Xth EAAE Congress 'Exploring Diversity in the European Agri-Food System', 28-31 August 2002, Zaragoza, Spain.

EUROPEAN COMMISSION (2011): Proposal for a REGULATION OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL establishing rules for direct payments to farmers under support schemes within the framework of the common agricultural policy. Brussels, 19/10/2011 COM (2011) 625 final/2.

GALE, H.F. (2003): Age-Specific Patterns of Exit and Entry in U.S. Farming, 1978-1999. In: Review of Agricultural Economics 25 (1): 168-186.

GLAUBEN, T., H. TIETJE and C. WEISS (2002): Intergenerational succession on family farms: Evidence from survey data. In: Proceedings of the Xth EAAE Congress 'Exploring Diversity in the European Agri-Food System', 28-31 August 2002, Zaragoza, Spain.

GLAUBEN, T., H. TIETJE and C. WEISS (2004a): Succession in Agriculture: A Probit and a Competing Risk Analysis. Selected paper for the Annual Meeting of the American Agricultural Economist Association (AAEA) in Denver.

– (2004b): Intergenerational succession in farm households: Evidence from upper Austria. In: Review of Economics of the Household 2 (4): 443-461.

HEDIN, S. (2005): Land restitution in the former Swedish settlement areas in Estonia – consequences for land ownership, land use and landscape. In: Landscape and Urban Planning 70 (1-2): 35-44.

HUFFMANN, W.E. (1977): Allocative efficiency: The role of human capital. In: Quarterly Journal of Economics 44 (1): 59-79.

IVASK, T. (1997): Põllumajandusreformi seaduse taotlused ja tulemused. In: EPMÜ teadustööde kogumik 188: 48-50.

JOVANOVIC, B. (1982): Selection and the evolution of industry. In: Econometrica 50 (3): 649-670.

LOBLEY, M., J.R. BAKER and I. WHITEHEAD (2010): Farm succession and retirement: Some international comparisons. In: Journal of Agriculture, Food Systems, and Community Development 1 (1): 49-64.

MAANDI, P. (2010): Land reforms and territorial integration in post-tsarist Estonia, 1918-1940. In: Journal of Historical Geography 36 (2010): 441-452.

PEERLINGS, J.H.M. and D.L. OOMS (2008): Farm growth and exit: Consequences of EU dairy policy reform for Dutch dairy farming. In: Proceedings of the XIIth EAAE Congress 'People, food and environments: Global trends and EU strategies', 26-29 August 2008, Ghent, Belgium.

PESQUIN, C., A. KIMHI and Y. KISLEV (1999): Old age security and inter-generational transfer of family farms. In: European Review of Agricultural Economics 26 (1): 19-37.

PIHLAMÄGI, M. (2004): Väikeriik maailmaturul. Eesti väliskaubandus 1918-1940. Argo, Tallinn.

POTTER, C. and M. LOBLEY (1996): The farm family life cycle, succession paths and environmental change in Britain's countryside. In: Journal of Agricultural Economics 47 (2): 172-190.

– (1992): Ageing and succession of family farms. In: Sociologia Ruralis 32 (2/3): 317-334.

PÕDER, A., A.-H. VIIRA and K. PUTK (2011): Farmers' opinions on the Outlook of Agriculture in Estonia: a Multiple Regression Analysis. In: Rural Development in Global Changes 5 (1): 185-189.

RIZOV, M. (2005): Human Capital and the Agrarian Structure in Transition: Micro-Evidence from Romania. In: Economic and Industrial Democracy 26 (1): 119-149.

– (2003): An essay on the agricultural production organization in former communist countries. In: The Social Science Journal 40 (4): 665-672.

RIZOV, M. and E. MATHIJS (2003): Farm Survival and Growth in Transition Economies: Theory and Empirical Evidence from Hungary. In: Post-Communist Economies 15 (2): 227-242.

RURAL ECONOMY RESEARCH CENTRE (2012): Economic Size Calculator for Agricultural Producers. In: http://www.maainfo.eu/data/so_calc/.

SCHNICKE, H., K. HAPPE, C. SAHRBACHER and K. KELLERMANN (2008): Exploring the role of succession patterns in central and Eastern European's dualistic farm structures. In: Proceedings of the 107th EAAE Seminar 'Modelling of agricultural and rural development policies', 29 January-1 February 2008, Seville, Spain.

STATISTICS ESTONIA (2012): Online statistical database. In: http://www.stat.ee (03/04/2012).

– (2002): Põllumajandus 2001. Agricultura 2001. Statistical Office of Estonia, Tallinn.

SWINNEN, J.F.M. (1999): The Political Economy of Land Reform Choices in Central and Eastern Europe. In: Economics of Transition 7 (3): 637-664.

TAYLOR, J.E., J.E. NORRIS and W.H. HOWARD (1998): Succession Patterns of Farmer and Successor in Canadian Farm Families. In: Rural Sociology 63 (4): 553-573.

UNWIN, T. (1997): Agricultural Restructuring and Integrated Rural Development in Estonia. In: Journal of Rural Studies 13 (1) 93-112.

VIIRA, A.-H., A. PÕDER and R. VÄRNIK (2009a): 20 years of transition - institutional reforms and the adaptation of production in Estonian agriculture. In: Agrarwirtschaft 58 (7): 294-303.

– (2009b): The factors affecting the motivation to exit farming – evidence from Estonia. In: Food Economics – Acta Agriculturae Scandinavica, Section C 6 (3): 156-172.

VÄRE, M. (2006): Spousal effect and timing of retirement. In: Journal of Agricultural Economics 57 (1): 65-80.

WEISS, C. (1999): Farm Growth and Survival: Econometric Evidence for Individual Farms in Upper Austria. In: American Journal of Agricultural Economics 81 (1): 103-116.

Acknowledgements

We wish to thank the two anonymous reviewers and the editors for their useful comments.

Contact author:
ANTS-HANNES VIIRA
Institute of Economics and Social Sciences,
Estonian University of Life Sciences
Kreutzwaldi st. 1, Tartu 51014, Estonia
e-mail: ants.viira@emu.ee