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**Landowner response to policies regulating land improvements:  
lease or search for other options?**

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## **Abstract**

Land improvements with long pay-back periods are often delayed on leased agricultural land, resulting in social costs through land degradation, decreased land productivity and environmental problems. An important question is thus how landowners would respond to regulations and mandates concerning land improvements. Based on a landowner survey, we analyse landowner choices under certain land improvement regulations, using the currently dominant choice of leasing land for agricultural use as the benchmark. The results indicated that land leasing will continue to increase in the future, but if the landowner mandate to co-finance costly land improvements is increased, landowners are predicted to respond significantly to these mandates and search for other land management options. Three heterogeneous landowner groups were identified based on their land use choices. Current leasers and amenity owners, in particular, were sensitive to land improvement mandates, and would avoid compulsory investment expenses by selling or afforesting their land.

### **Key words:**

contingent behaviour, latent class model, landlord, land use, heterogeneity  
(JEL Q15, Q24, Q28)

## **INTRODUCTION**

In most Western countries, technological change in agriculture has reduced the number of farms and increased farm size. At the same time, structural development in the ownership of arable land has only been moderate or has fragmented land ownership even further, as former farmers and their heirs have maintained capital in land while moving to off-farm occupations (Ryan et al., 2001). Some landowners who are no longer active farmers have left their agricultural land idle or afforested it, while others have kept their land in agricultural use through leasing to neighbouring active farmers. In many Western countries, the land area cultivated under lease contracts has gradually increased and already comprises a substantial share of the total arable land area (Ciaian et al., 2010). In Finland, land leasing has increased rapidly since the 1980s, and the share of land cultivated under lease contracts is currently 33% of total arable land area (Myyrä et al., 2008).

Under fixed-term cash lease contracts, which are common in many European countries, the tenant's incentives to carry out long-term land improvements are weakened by the insecurity of land tenure (Soule et al., 2000; Holden and Hailu, 2002; Fraser, 2004; Myyrä et al., 2005). Current land rental markets may be informational inefficient, as information on land quality may not be available to the tenant or some of the quality characteristics may not really contribute to the lease price. This lack of information hinders full internalization of the economic surplus generated by land improvements to the agents who pay the sunk cost of these improvements. These market failures and problems in rent sharing are important, because they have been found to reduce land improvement and have had significant effects not only on agricultural productivity, but more generally on the protection of the environment, particularly water quality, and the recreational value of rural assets.

A commonly implemented policy option is to impose mandates or obligations for land improvements in order for a farmer to be eligible for public agricultural support programmes.

Obligatory responsibilities are used, at least in the current agricultural policy of the EU. The Common Agricultural Policy (CAP) requires farmers to respect cross compliance standards in two ways. First, all farmers claiming direct payments must follow the standards of good agricultural and environmental practices, avoiding the abandonment of agricultural land and its environmental consequences. Second, they must respect statutory management requirements relating to the protection of the environment, as well as public, animal and plant health, and animal welfare (EC 2003). Under the Finnish production environment, for example, investments in irreversible land improvements, such as drainage systems, are often necessary to protect the environment, for instance by reducing nutrient leakages.

Thus, it is evident that certain noteworthy mandates and obligations have already been imposed in the current CAP through cross compliance and environmental regulations, but at least in the Finnish case, it is the tenant who as an active farmer is responsible for fulfilling these obligations, not the landowner. However, as the current practice does not produce satisfactory results, these obligations could also be imposed on the landowner to increase the benefits of environmental programmes and target the sustainable long-term development of farmland ownership. This issue is also relevant from the income distribution perspective, because it is argued that landowners, not tenants, have gained the greatest benefits from the CAP, because the supports have capitalized in short-term land rents (Ciaian et al., 2010). The issue of targeting such obligations at landowners rather than their tenants has institutional counterparts in Finland in legislation mandating the owners of forests and real estates to implement fundamental improvements.

Recently, it has also been more broadly recognized that land property rights have been shifting from the wide concept of ownership and unrestricted use of natural resources to ownership including duties of stewardship (Rodgers, 2009). Nevertheless, the existing empirical literature has shown little interest in the effects of compulsory conservation regimes or policies obligating land improvements, and the reactions of landowners to these considerable regulations have remained unknown. Policies that enforce land improvements can also encourage landowners to select other land use alternatives, either to avoid the anticipated costs from the obligations or to better subtract the resulting surpluses, rather than committing them to meeting the land improvement obligations and trying to share their costs or to cashing in on their long-term benefits through lease arrangements. Thus, obligations for land improvement could encourage land sales or afforestation. It has been suggested that there may also be heterogeneity in landowner reactions to a policy of land improvement obligations, *i.e.* some owners may be more inclined to continue as landlords and invest in their land, while others may search for alternative options (Pouta et al., 2010).

The objectives and approach of this study are first to analyse the characteristics of our benchmark choice of land leasing. We estimate the agricultural land leasing behaviour and future leasing intentions of current landowners based on a survey of Finnish farmland owners. A policy to obligate the landowners to make land improvements is evaluated as a potential policy instrument to prevent land degradation. To analyse the effect of such a land improvement obligation (LIO), we use a contingent behaviour method that focuses on the choices of landowners between either leasing land or other land use alternatives, conditional on the obligations for land improvements with different monetary expenses. Finally, we analyse the heterogeneity of land use choices between different types of landowners and their reactions to an improvement obligation.

## METHODS

### *Sampling and survey method*

The sample of landowners for this study, including both active farmers and passive landowners, was selected from the register of the Finnish tax administration based on the 2004 situation. The register included information on approximately 500 000 individual farmland owners. To define the criteria for sampling, the field area distribution and regional distribution of ownership in the population were analysed. This information was used to partition sampling clusters to guarantee a representative sample of both active and passive landowners and various farm sizes in all regions of the country.

A mail survey was used to acquire data on landowners' sale preferences. A questionnaire was mailed to a sample of 5 762 land owners.<sup>5</sup> To ensure a sufficient response rate, we used a modification of Dillman's total design method (Dillman, 1978) including several contacts with the respondent, *i.e.* a reminder postcard and re-mailing of the questionnaire. Focus groups and a pilot survey were used to develop the questionnaire. Consideration of the annual duties of the farmers in choosing the mailing time (late autumn in 2006) was important to achieve a high response rate.

The mail survey yielded a total of 2 684 observations from the sample of landowners. This represented 47% of the total number of mailed questionnaires. The data represented the population of farmland owners quite well, although older male owners with large properties were slightly over-represented.

### *The questionnaire and contingent behaviour*

The questionnaire focused on a single real estate owned by the responding landowner. In the questionnaire the current land use choices were measured by asking whether the use of agricultural land during the previous summer (2006) included farming, managing without farming, leasing, setting aside and/or afforesting. Respondents selected either "yes" or "no" for each alternative. A question on future land use intentions assessed in a similar way whether the respondent intended to farm, manage without farming, lease out, sell, set aside and/or afforest all or part of the agricultural land on the estate in the next five years (yes/no). The pilot study allowing a distribution of land allocations in percentages revealed that the total field area was typically allocated to only one land use option. If two alternatives were chosen, the allocation was typically 50% / 50%. This supported the use of a dichotomous scale for each land use choice in the final questionnaire.

To examine the effects of a land improvement obligation we used the contingent behaviour method, which has typically been applied in recreation economics for the purposes of resource valuation (Engling and Cameron, 1996; Grijalva et al., 2002). However, in our case we were not interested in the value of alternative land use options or the policy benefits but the behavioural response to a conjectured regulation. In a contingent behaviour survey, respondents are presented with a hypothetical situation in which either the price or the quality of a good is altered, and their behavioural reaction to such a change is assessed. In our case, the policy option of a land improvement obligation was introduced to the respondents. The land improvement obligation was reported to concern basic land improvements such as liming and drainage. The improvement obligation would cause a sunk cost every five years and, averaged over the years, the cost of the required improvements would be either 60, 90, 120 or 150 euros/hectare/year. The improvement obligation would cover not only leased land, but also land cultivated by the owner him/herself as well as land managed without farming. After presenting this information, the landowners were asked about their land use choices under the agricultural land improvement obligation. Again, all

the land use alternatives were provided and the landowners responded “yes” or “no” to each alternative, implying that they would allocate either part or whole of the field area to that alternative.

The socio-demographic and household characteristics of the landowners were measured with typical background questions and the economic data were completed with register information on agricultural taxation and income taxation, including variables such as income from agriculture, off-farm capital income, and off-farm labour income. Farm-related information comprised measures such as the importance of forestry, the spatial coherence of the fields and the existence of production buildings and machinery. In addition to these, we measured landowner perceptions of the local land markets in terms of perceptions of the number of possible buyers and renters.

The objectives for land ownership were assessed using 28 separate items with a five-point response scale. These items were used in latent class analysis to form landowner groups. As a result of this latent class analysis based on land ownership objective statements, five owner groups were formed (reported in detail in Pouta et al., 2010). The first group comprised *agricultural earners*, who emphasized objectives that were associated with income, but also with economic security. For *multiobjective owners*, almost all objectives were considered important, including agricultural income, economic security as well as objectives linked to the environment and traditions. *Family-oriented owners* emphasized objectives related to leisure and traditions. *Dispassionate amenity owners* valued objectives related to traditions, recreation and nature, but these objectives were not perceived very strongly among these landowners. None of the objectives were important for *indifferent owners*.

#### *Descriptive statistics of land leasing*

The land use choices are presented in Table 1. The first column describes land use choices in the survey year, while the second column gives the land use intentions in 2011, and the third one the land use intentions under a land improvement obligation (LIO) policy in 2011. From 1 200 to 1 700 respondents answered various dichotomous questions concerning land use alternatives. As several land use alternatives could be chosen at the same time, the cumulative share of participants could overlap and was not restricted below an upper bound of 100%. Leasing out land was the most frequently selected land use alternative under both time frames and also under the LIO policy. However, under the LIO policy, the share of intending leasers was 13 percentage points lower than without the policy. Indeed, under the LIO policy, the share of landowners was lower than without the policy for all land use alternatives except land selling, for which it was 14 percentage points higher under the LIO policy.

Table 1. The current (2006) choice of land use alternatives, together with the future (2011) intention and intention (2011) under a land improvement obligation (LIO) policy.

Land use alternative	Current	Future	Future
	chosen alternative, % share		
Leasing out	56.1	61.2	48.2
Farming	55.1	50.7	47.1
Management without farming	33.8	43.2	42.1
Selling	*	14.9	28.4
Setting aside	19.6	25.4	21.2
Afforestation	10.3	47.1	36.5
Total	174.9	242.5	223.5

\*not measured, as the focus was on currently owned agricultural land

### *Econometric approach*

In the statistical models, the decision to lease was defined as the benchmark. It was modelled first as a separate choice and independent of other land use options. Second, all six land use options were constructed in the choice set and the choice between all land use alternatives was modelled.

First, three logit models were estimated to explain with co-variants the current leasing choice and future leasing intentions with and without a policy imposing mandatory land improvements.

Second, to analyse the effect of time and policy on the leasing decision, we focused on the leasing choice as a sequence of the three binary dependent variables, the decision to either lease or not to lease land (1,0). These choices provided a three-row data set for each respondent, similar to panel data. Independent variables, in addition to farm and owner characteristics, were the TIME variable,  $t$ , to describe whether the leasing decision was current or future, and the LIO variable if the policy  $p$  was implemented, implying a cost to the landowner. In this way, the policy variable was zero in the selection of the present land use and for the future intention without an LIO policy. When the responses from the contingent behaviour question were examined, the policy variable obtained positive bid values. A panel logit model was used.

The land leasing decision  $j$  is only one option from the total choice set of land use alternatives  $n$ . In the next step we were interested in the alternative land uses as compared to the benchmark of leasing out the land. First, we used a conditional logit model (McFadden, 1974) to model the choice between the land use alternatives given the land use attributes and the cost of the land improvement obligation. Second, to allow heterogeneity among respondents, we applied a latent class model (Boxall and Adamowicz, 2002). Behind the observed variables, a number of unobserved variables may exist that could indicate separate subpopulations, each having their own distribution of observed variables. In our application, there might be subpopulations of landowners with their own distributions in relation to land use choices. To take this heterogeneity into an account and improve the explanatory power of the conditional logit models, latent owner groups were investigated with a latent class model. The basic idea in a latent class model for binary choice data is that the parameters of a regression model differ across estimated classes (Wedel and DeSarbo, 1994). In modelling the choice between all land uses, the data were rearranged so that those respondents who selected only one land use alternative were coded into six rows in the new data set, each row representing one alternative. Those owners who selected more than one alternative were given a number of rows that was equal to the selected alternative times six possible alternatives. Their rows in the data were weighted with a factor (1/selected alternatives) to give each respondent an equal weight in the data. From the several models with alternative class sizes, the Bayesian information criteria (BIC) were used to define the number of classes.

In the specification of each model we attempted to include relevant variables from the categories defined in the previous literature, *i.e.* policy variables, in this case the cost for the landowner, farm characteristics, landowner and household socio-demographic attributes and landowner objectives. Several farm-level economic variables such as the market return or subsidies were only positive for the active farmers and were omitted due the large number of zeros that correlated with the landowner objective classes.

## RESULTS

The single land leasing choices over other land use alternatives were first estimated with three separate logit models (Table 2). The first model was specified for the current behaviour, the second for future intentions with the current policy, and the third for future intentions with a management obligation policy. The first model for the current choice of leasing classified 57% of owners as leasers. The model revealed several farm and owner-related characteristics that significantly predicted the leasing choice. A larger field area reduced the probability of leasing, and leasing was more likely in agriculture-oriented southern and western Finland than in northern and eastern areas of the country, where leasing markets are very limited. The farms with a higher probability of leasing represented a lower level of capital in production buildings and machinery. According to the model, elderly landowners living outside the farm compound were more likely to lease out their land than other owners. From the land ownership objective classes, family-oriented owners and dispassionate amenity owners, in particular, decided to lease out more often than owners in other objective classes.

Table 2. Land leasing choices.

	Current leasers		Future leasers		Future leasers under LIO		All choices in panel	
	b	p-value	b	p-value	b	p-value	b	p-value
Intercept	-0.308	0.341	1.230	0.000	-1.262	0.000	-1.028	0.000
Time							0.310	0.004
LIO cost					0.001	0.766	-0.005	0.000
Field area	-0.016	0.002	0.036	0.000	-0.024	0.000	-0.028	0.000
Eastern Finland	-0.495	0.001			-0.285	0.051	-0.232	0.032
Northern Finland	-0.842	0.000					-0.419	0.002
Production buildings and machinery	-0.317	0.000					-0.193	0.000
Owner's age	0.026	0.000	0.025	0.000	0.022	0.000	0.029	0.000
Lives on the farm	-0.267	0.067					-0.276	0.012
Owner's perception of rental market			0.320	0.002			0.148	0.019
Objectives: Agricultural earners (ref.)		0.000		0.048		0.002		0.000
Multiobjective owners	0.267	0.222	0.291	0.169	0.311	0.147	0.511	
Family-oriented owners	0.908	0.000	0.583	0.005	0.584	0.004	0.969	
Dispassionate amenity owners	0.664	0.000	0.469	0.013	0.168	0.365	0.625	
Indifferent owners	-0.152	0.561	0.249	0.373	-0.389	0.150	0.316	
N	1233		1121		1076		848	
Lease based on data, %	51%		62%		44%		53%	
Lease based on model, %	57%		80%		38%		60%	
Correctly classified	69%		70%		61%		70%	
Log-likelihood (model)	-725		-670		-700		-1472	
Chi-squared	256		158		103		11790	
p-value	0.000		0.000		0.000		0.000	
Nagelkerke-R <sup>2</sup>	0.24		0.18		0.12		0.21	

In the second model, the average probability for a future intention to lease agricultural land was estimated at 80%, which was 23 percentage points greater than the estimated current leasing



probability. In relative terms, the result suggests that land leasing will increase by more than a third (40%) in the near future. However, the leasing choice was not as easily explained with background variables, as only a few of the previous variables, such as the owner's age, objectives and the field area, were significant. Concerning future intentions, market access was more of a concern, as the owner's perceptions of rental markets, *i.e.* the number of potential renters, significantly increased the intention to lease.

The variable of special interest in the third model predicting the intention to lease under an LIO policy was the cost of the LIO to the landowner. The cost variable was not, as such, significant in explaining the leasing intentions. This was partly explained by the fact that in the data under the LIO policy used for this model, all respondents faced a positive cost due to the LIO policy and no zero cost was included. However, based on the model, the introduction of the LIO policy reduced the average probability for an intention to lease agricultural land to as little as 38%.

To further explore the effects of the time horizon and the LIO costs from the zero level to positive expenses, as well as the time horizon of the land use decision, we estimated a model for the sequence of three possibly interrelated leasing choices in the panel data. The model controlling for all three choices confirmed the significantly increasing interest in land leasing, as the time variable obtained a positive coefficient. In this specification, the LIO cost variable also significantly reduced the probability of leasing out agricultural land. The other explanatory variables followed the lines of the three previous models.

The model for panel data was further used to predict the effect of the LIO cost on the proportion of land leasers and on the share of leased agricultural land (Figure 1). As there was a strong tendency towards increasing lease intentions in the future, it is interesting to define the level of LIO costs that would balance the growth in leasing. The level that would balance the growth to the current level of 51% (in the data) of landowners was determined to be 120 euros per hectare per year. This figure also illustrates the strong distinction between the proportion of leasing owners and the share of leased agricultural land area due to the negative effect of the land area owned on the probability of leasing. The difference in behaviour between owners of various size holdings was considerable, as illustrated in the second part of Figure 1.

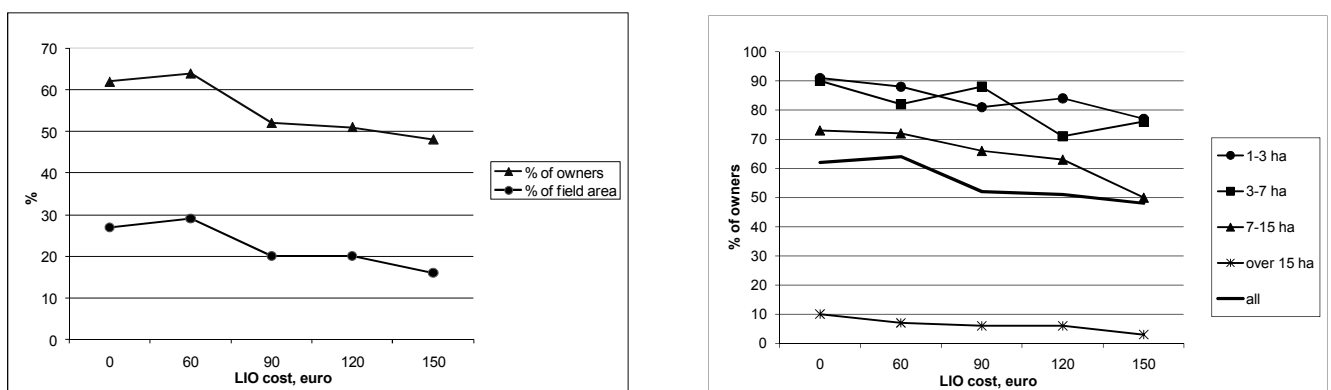


Figure 1. Cost of the land improvement obligation (LIO) and the probability of leasing in the future.

Table 3. Choice between land use alternatives.

	Conditional logit		Latent class model				
	b	p	Farmers	Landlords	Amenity owners	Wald overall p-value	Wald equality p-value
			Class1	Class2	Class3		
Class size, %			37%	35%	28%		
LIO cost	-0.005	0.00	-0.006	-0.006	-0.006	0.000	-
Land use label		0.00					
leasing out	0.000					0.000	0.000
farming	-0.501		1.573	-5.809	-0.849		
management without farming	-0.773		0.686	-2.988	-0.262		
selling	-1.803		-1.474	-1.593	-2.248		
setting aside	-2.310		-7.750	-3.881	-1.408		
afforestation	-1.582		-2.004	-2.669	-0.696		
Model for classes							
Intercept				-3.124	-0.284	0.002	
Field area				-0.022	-0.052	0.087	
Southern Finland				0	0	0.012	
Eastern Finland				-0.158	0.128		
Western Finland				0.289	-0.139		
Northern Finland				-0.783	1.107		
Share of revenue from forestry				0.015	0.023	0.013	
Production buildings and machinery				-0.399	-0.335	0.006	
Owner's age				0.098	0.073	0.000	
Lives on the farm				-1.066	-1.192	0.043	
Owner's perception of rental market				-0.388	-1.623	0.000	
Objective: Agricultural earners				0	0	0.001	
Multiobjective owners				0.328	0.638		
Family-oriented owners				1.359	2.149		
Dispassionate amenity owners				2.151	1.893		
Indifferent owners				8.483	7.393		
N	1188		736				
Correctly classified, %	37%		52%				
R <sup>2</sup>	0.08		0.27				

As the choice to lease agricultural land is followed in a landowner's decision making by the choice of an alternative land use, we reformulated the dependent variable to indicate the choice between various land use alternatives. The conditional logit and the latent class models for the choice between land use alternatives are presented in Table 3. In the conditional logit model, we used two attributes of land use as explanatory variables for choice, *i.e.* the constant for each land use alternative and the LIO cost associated with each land use. The results revealed the likelihood order of the choice for various land use alternatives compared to leasing by the landowner, which

was the reference level in the model. Leasing out land was the most preferred land use alternative. All the other land use forms were less frequently chosen. The uses that were particularly seldom chosen were setting aside and selling the land. The model confirmed that respondents were significantly less likely to select a land use if it involved LIO costs.

The latent class model (Table 3) for the land use choices provided a picture of the heterogeneity of landowners in their land use choices. After running several models with an increasing number of classes and using the BIC information criteria in ranking the specifications, we ended up with a three-class model. Two out of the three classes could be easily interpreted from the leasing behaviour and background variables. The *farmers* formed over third (37%) of the sample and the *landlords* one third (35%). The third group, representing 28% of the full sample, was named as *amenity owners* based on their landowner profile.

The LIO cost had a significant negative effect on the probability of choosing a related land use alternative in all groups, but there were no significant differences in the effect of the LIO between groups. In the model with three classes, leasing out land was preferred to all other land use options by the landlords and amenity owners. Compared with farming, landlords also considered all other land use alternatives, particularly selling, as positive. For farmers, all the other land use options were less preferred than farming, as expected. The amenity owners preferred management without farming as well as afforestation almost as much as leasing. They considered selling to be the least preferred alternative.

The covariates of this latent class model revealed the socioeconomic profile for the three landowner groups. In the lower part of Table 3, the groups are further described with farm and landowner variables, having *farmers* as a reference group. In the group of *landlords*, when compared to *farmers*, the farm profiles were quite apparent: a smaller field area, lower level of previous investments in production buildings and machinery and a higher share of income from forestry. Landowner profiles also provided a natural description of the difference between farmers and landlords, as landlords were older and more often lived outside the farm. Compared to farmers' objectives, the landlords more often belonged to owner groups emphasising objectives other than agricultural earnings.

Of particular interesting was the profile of the *amenity owners*. Their estates were even less production-oriented than the estates of landlords. These estates were located in northern and eastern Finland, which are regions of less intensive farming. The field areas were small and there were fewer production buildings and less machinery on the forestry-oriented estates. Owners' perceptions of the number of potential renters were lower than in other owner classes. Family- and amenity-oriented objectives were emphasised in this class.

The latent landowner classes in Table 3 were used to predict the land use choices in each group of landowners. In the group of landlords, the LIO cost shifted choices from leasing to selling, setting aside and afforestation. Similar, but smaller changes were also observed in the group of amenity owners, where the LIO cost particularly increased the share of owners choosing afforestation. In the group of farmers, the response to the LIO costs was negligible.

## CONCLUSIONS

Our results on landowner intentions suggest that land tenancy is likely to increase considerably in Finland in the near future, unless targeted policies are designed to reverse the prevailing development patterns. The structural separation between land ownership and farming will continue in the future as the current farmers age, retire and are inclined to lease rather than sell their land. Based on the characteristics associated with leasing, the estimates consistently indicate that leasing is a preferred alternative for many landowners who do not live on the farm, do not have adequate production machinery or buildings, or are ageing but do not have a successor for the farm in the family. Although the probability of leasing is generally increasing over time, the development also exhibits large spatial differences. The data indicate that leasing is no longer an alternative in the most remote and sparsely populated rural areas, where agriculture has declined to the extent that the markets for leasing are weak.

The results suggest that landowners respond to regulations that increase their costs, even if these costs relate to land improvements that are expected to increase productivity, environmental sustainability and the value of their agricultural land. Landowner responses are, nevertheless, heterogeneous, and heterogeneity among landowners is characterized by three different groups with respect to their land use choices and their reactions to land improvement obligations. In addition to the very obvious group of farmers, the groups of landlords and amenity owners had significantly different preference structures for the use of agricultural land. The main interpretation of these two groups is that they operate in spatially different circumstances, as for the landlords in western Finland the rental markets have offered opportunities for leasing out, but in eastern and northern parts of the country forestry provides opportunities for amenity ownership beyond agriculture. The existence of these groups indicates that policies promoting land improvements can lead to different land use choices individually and spatially.

The land improvement obligation (LIO) would be a policy that has a very different target group compared to the current Common Agricultural Policy (CAP) in Europe. It would attempt to keep otherwise passive landowners involved in the productivity enhancing management of their land. Based on our results, we can conclude that for many landowners, such drastic regulation would, nevertheless, not only directly promote land improvements, but would also have broader implications for land use. The LIO would encourage landowners to search for land use options, such as land sales and afforestation to avoid LIO costs. Afforestation is considered as an attractive option to avoid these costs, particularly amongst amenity owners.

The preference for avoiding the LIO cost was estimated to be strongest amongst those landowners who do not cultivate their land by themselves and, thus, cannot directly collect the benefits that the land improvements would generate. This result is consistent with earlier findings concerning market inefficiency in land leasing between the landlord and the tenant (Myyrä and Pouta, 2010). It suggests that landowners who have leased their land may face higher than average uncertainty over subtracting the future economic surpluses generated by the obligations they would be regulated to pay.

We conclude that such a strong regulatory approach as the LIO policy would be consistent with resolving land tenure insecurity problems and enhancing land productivity, but its efficiency

deserves at least a question mark. The obligation for improvements would partly reduce land tenure insecurity through activating land sales, but it would also encourage some landowners to switch their land use more broadly, so that more land would be allocated to non-agricultural purposes.

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