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# Feasibility of the Income Stabilisation Tool in Finland

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*Abstract*

*Whole-farm income insurances are promoted in the new post-2013 Common Agricultural Policy (CAP). The current Crop Damage Compensation (CDC) scheme in Finland covers crop failure for farmers who have suffered losses and applied for the payments. This paper analyses the use of the Income Stabilisation Tool (IST) and compares it to the current CDC scheme in Finland. The Finnish Farm Accountancy Data Network (FADN) is used to simulate the costs of IST compensation payments. Special attention is paid to pig farms and their possibilities to manipulate the IST. Results show that the IST is triggered with a high frequency on Finnish farms. The IST would be more costly than the current CDC programme. The results also suggest that the IST would act as an income transfer policy if farmers could influence their annual income. However, the efficiency of the IST as an income transfer policy is questionable due to its large transaction cost.*

*Keywords: Income stabilization tool, moral hazard, Farm Accountancy Data Network*

*JEL classification: Q14*

## 1. INTRODUCTION

Farmers can use a number of formal and informal tools to guard against and overcome variability in farm incomes. Informal tools such as savings, land improvements, drainage systems and irrigation systems are needed not only to smooth income variability but also to increase productivity in agriculture. Another example of a set of informal tools is the timing of purchases of inputs and sales of outputs. Informal tools are widely used by farmers, and formal tools, weather insurances, price hedging products or income stabilization tools should not override farmers' own informal actions to guard against and overcome variability in farm income. Despite the existing tools that farmers can already use, high volatility in agricultural commodity prices has increased the interest in implementing a new tool to reduce the variability in farmers' incomes. The pig husbandry sector, in particular, has suffered from high volatility in pig meat as well as grain prices. Thus, pig husbandry data provide a good starting point to examine how pig farmers would adopt a formal risk management tool and what their informal actions would be within given economic boundaries using such a tool.

Finland is the northernmost member of the EU, where agricultural production is operated under extreme climatic conditions. The harsh climate and northern location causes high variability in crop yields and commodity prices. Weather inconstancies and small markets combined with asymmetric information have not created incentives to develop private crop insurance schemes in Finland (Myyrä and Pietola, 2011; Myyrä et al., 2011; Pietola et al., 2011). Moreover, the current Crop Damage Compensation (CDC) scheme is administered and fully financed by the government. Thus, no formal yield or income insurances provided by private insurance companies exist in Finland. The CDC scheme covers crop failures for farmers

who have suffered losses and applied for the payments. However, the CDC scheme has been shown to suffer from serious moral hazard problems (Myyrä and Pietola, 2011). Increased variability in agricultural commodity prices as well as a new option within the Common Agricultural Policy (CAP) has raised interest in constructing more efficient risk management tools for Finnish farmers. The CAP may provide a new tool to tackle income variability in the Finnish farming sector. However, some serious drawbacks could be involved and the outcome from these tools might be the opposite of their original purpose.

The CAP is due to be reformed in 2013. On 12 September 2011 the European Commission released seven legislative proposals revealing the structure of the CAP for the period 2014–2020. New risk and crisis management instruments are to be introduced as part of the proposal on support for rural development, also known as the second pillar of the CAP (EC, 2011). More specifically, whole-farm income insurances are to be promoted in the new policy as an Income Stabilization Tool (IST), and this tool will be available for all EU member states.

Before any new risk management programmes are implemented, it is important to describe the needs and research the possible effects of the IST in Finland. Subsidized formal risk management tools may function as a tool for transferring wealth from taxpayers to farmers and impede active risk management on the farm level. Several studies have suggested that different crop insurance schemes and disaster relief programmes increase farm incomes. Goodwin and Rejesus (2008) noted that farmers who purchase crop insurance in the U.S. appear to be more profitable. The result suggest that farmers who take out insurance and are in areas with greater disaster assistance are better farm managers, or that disaster relief and crop insurance payments are a form of wealth transfer to the farmers. Schaufele et al. (2010) reported that the Canadian AgriStability programme, which is similar to that introduced in the CAP 2013 reform, is highly subsidized. They demonstrated that when there is a catastrophic price risk, it is profitable for Canadian cow-calf producers to participate in the AgriStability programme, despite the risk their farms face. This means that programme enrolment fees are disconnected from the actual risk that a farm confronts.

This paper analyses the use of the IST and compares it to the current CDC scheme in Finland. Another objective of this paper is to analyse whether the IST programme would function as a form of wealth transfer instead of an income stabilization tool for farmers. In particular, the most efficiently managed farms confronted with an adjustment capacity could manipulate the IST by amplifying income waivers with informal risk management tools. This effect is analysed in the Finnish the pig husbandry sector. The Finnish Farm Accountancy Data Network (FADN) is used to simulate the costs and dispersion of IST compensation. The optimal behaviour of farmers under the IST is analysed and compared to the recorded performance of FADN farms.

## 2. THE CURRENT AND FUTURE RISK MANAGEMENT TOOLS IN FINLAND AND INTERNATIONAL COMMITMENTS

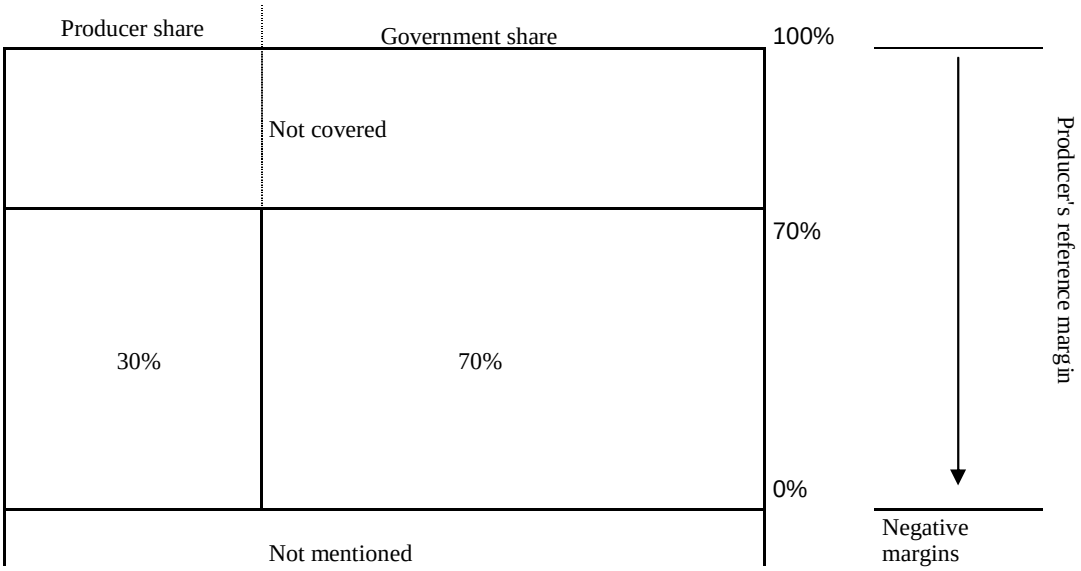
### *2.1. The CDC programme in Finland*

The main characteristics of the Finnish Crop Damage Compensation (CDC) programme are similar to those in the traditional multi-peril crop insurance. A farmer is entitled to crop damage compensation (an indemnity payment) if the whole farm yield is damaged to the extent that it is at least 30% below the corresponding regional reference yield. The reference yield is the regional average yield confirmed annually by the Ministry of Agriculture and Forestry. The programme only compensates quantity losses that exceed the 30% threshold, and average producer prices are used to determine the monetary amount of compensation. Losses are monitored on the farm. Regarding quantity losses, the coverage of the indemnity payments is 100%, because all losses exceeding the 30% threshold are compensated. Nevertheless, with regards to quality losses, the coverage is zero, as the losses due to reduced quality are not compensated at all. As a result, the true protection level (usually referred as the coverage) is lower for high performance (yield & quality) farmers than for low performance farmers (Myyrä and Pietola, 2011).

### *2.2. The structure of the Income Stabilisation Tool*

Under the IST a farmer would be eligible for payments after a loss of greater than 30% relative to the Olympic average of the farm's historical income measured by the profit margin. The income reference, i.e. Olympic average income, is determined by calculating the five-year average of the income without the highest and lowest values. This calculation creates the reference margin that is compared to the annual profit margin. According to the European Commission proposition (EC, 2011), 70% of the losses that are below the 30% limit are covered. The procedures for negative margins are not mentioned in the European Commission proposition (Figure 1). The profit margin is the sum of revenues the farmers receive from the market, including public support and deducting input costs from agricultural production. These definitions for the reference margin and profit margin are applied throughout this paper. The costs of the IST scheme are to be covered by the state (65%) and farmers (35%).

Figure 1. The structure and cost sharing of the IST tool introduced in the CAP 2013 reform




Source: (EC, 2011)
*) In our descriptive statistics it is assumed that the IST also covers negative margins. When a producer has a negative net margin and the annual profit margin shows a greater than 30% loss compared to the reference margin, the producer is eligible for compensation.

### *2.3. WTO commitments*

The IST introduced for farmers in the EU is structured to be compatible with WTO commitments. A similar programme to the IST is being used as income safety net for farmers, for example, in Canada. Canadian agriculture has a long history of IST programmes (Schmitz, 2008). Despite the similarities, the construction of the Canadian income stabilization tool differs from that introduced in the EU. The current IST programme in Canada is called AgriStability. In the AgriStability programme, payments are triggered when a producer's programme year profit margin falls below 85% of the average reference margin. The average reference margin is calculated as the Olympic average from the five previous years, just as in the EU IST. The government share of the programme expenses is 70% when the programme year margin is 70–85%, and 80% when the producer's margin falls below 70% of the average. The AgriStability programme also covers negative margins. When a producer has a negative net margin, 60% of the losses are covered (Antón et al., 2011).

The Canadian AgriStability programme is not categorized as green box support under the WTO's Uruguay agreement. In the WTO Uruguay agreement, agricultural support payments are categorized into green, blue and amber boxes. Payments that fall into the green box are classified as non-trade distorting support. If payments from the IST programme are categorized into the green box, farmers can receive payments when their annual income falls below 30% of their average income. The Uruguay round agreement restricts government payments to 70% of the loss compared to the average income. The average income should be based on the previous

three years, or if possible on a five-year period excluding the biggest and lowest values, i.e. the Olympic average. In addition, IST payments should not be connected to production volumes, prices or factors of production (WTO, 1994). No agreements in the WTO Doha Round should bring changes to the rules applied in IST programmes (WTO, 2008).

If these above-mentioned conditions are not met, government support is calculated under the so-called amber box. The total amount of support in the amber box is constrained by the de minimis percent. In developed countries, the maximum amount of amber support is 5% of the total or product-specific value of agricultural production.

In the AgriStability programme, the low limit for compensation eligibility and high compensation rates increase the welfare of farmers who participate in the programme. Schaufele et al. (2010) estimated that the AgriStability programme increases cow-calf producers' expected benefits by some 12%. Kimura and Antón (2011) suggested that AgriStability is a socially more acceptable form of support to farmers than fixed income supports such as single farm payments in the EU. Using IST programme in the EU as a form of income support to farmers is also possible. However, it should be taken into account that increasing the government support in the IST programme would increase the amount of the EU's overall amber box support. This limits the possibility of national governments to use the IST programme as a new form of agricultural support. The transfer efficiency of IST programmes is also weak. According to Rude and Ker (2010), the Canadian AgriStability programme has a transfer efficiency of only 39%. Their results suggest that a major part of the programme payments are transferred to agricultural input suppliers.

## 3. METHODS

This paper analyses the use of the IST and compares it to the current CDC scheme in Finland. The Finnish Farm Accountancy Data Network (FADN) is used first to describe and then to simulate the costs of the IST and dispersion of IST compensation payments in Finland. The dataset includes some 1000 farm operators per year from 1998 to 2009. Special attention is paid to pig farms and their possibilities to manipulate the IST. This type of manipulation is well recognized in yield insurances and is generally referred to as a moral hazard problem (Chambers, 1989). The methods used aim to reveal whether the IST give incentives to amplify income waivers instead of its original purpose to smooth them as a result of attempts by farmers to raise their mean income over time. This type of opportunistic behaviour, where farmers merely change the timing of their output sales and input purchases, is not as well recognized as risk increasing behaviour in farmers in yield insurance contracts (Smith and Goodwin, 1996; Roberts et al., 2006).

## 4. DESCRIPTIVE STATISTICS

First we conducted a static analysis of hit rates and possible indemnity payments for static implementation of the IST to Finnish FADN data. This implementation does not count any

adjustment of farmers to IST rules. It also assumes that the IST is 100% up taken by the farmers. These assumptions make the IST and CDC comparable, since the CDC scheme is openly accessible and full funded by the Finnish government. The data used covered the years 1998–2009. Attention was mainly paid to hit rates and the total costs of the programme. The hit rate describes the proportion of farmers compensated by the programme. The costs of the programme are the sum of indemnity payments. Programmes were assumed to be fairly priced, and the sum of insurance payments thus equals the out-paid indemnity payments. Transaction costs and the division of costs between farmers and the government were not studied. The static approach takes the first part of our analysis on a completely different track to the mainstream of research related to farmers' safety nets against adverse weather events and commodity price waivers. The mainstream of research has concentrated on the demand for and uptake of insurances by farmers (Goodwin and Rejesus, 2008). We currently have no estimates of farmers' willingness to purchase insurance contracts such as the IST.

The descriptive statistics here start with statistics on the current variation in farm income. The profit margin is measured using performance-based counts so that sales of the products are connected to the years when the products are produced. The input purchase costs are also connected to those years when the inputs are used in production. The calculations are based on Farm Accountancy Data Network (FADN) standards. The implementation of these standards is time-consuming and significantly costly. For example, the time lag from current to readily calculated FADN results is approximately two years[1].

These statistics are a clean starting point, because they do not include any farmers' actions aimed at income manipulation. Incomes do vary naturally because of weather conditions, price and subsidy waivers and changes in farm productivity and the scale of production.

## 5. LINEAR PROGRAMMING TO REVEAL FARMERS' ACTIONS

Linear programming was used to map the possibilities of farmers to adjust the reference margin, which is the basis for IST compensation, to maximize their farm incomes in the long term. The realized profit in year t is measured as follows:

$$= \quad + \quad + \quad + \quad ( \ )$$

$\pi_t$ = realized profit
$pm_t$ = profit margin in year n

[1]See, for example, www.mtt.fi/economydoctor

$A_t$ = annual adjustment possibility for the profit margin
$IST_t$ = indemnity payment from IST
$IST(C)_t$ = cost of participating in the IST

Finnish farms are taxed on the cash-based annual income statement. It is most likely that implementation of the IST would be based on taxed incomes. It is known that Finnish farmers are able to adjust their taxed annual income to smooth income waivers. They cannot change their income level in the long term, but annual output sales and input purchases could be adjusted by changing their timing. These endogenous choices build the annual adjustment possibility $A_t$. This is already used to smooth annual changes in taxed incomes. However, $A_t$ could be also used as a trampoline mechanism to induce larger variation in annual profit margins and thus to manipulate the Olympic average. This would, of course, affect indemnity payments from the IST and farmers' profits over time. In our analysis we tested what would happen if the average pig farmers in Finland had the possibility to use $A_t$ optimally over the years 1998–2009. We used tight restriction for $A_t$ to keep study setup realistic. Thus, for pig farmers:

$$\max \pi \sum$$

Subject to:
$A_t$=[-€5000 … 5000]
$A_t + A_{t+1} + A_{t+2}$=[-€2500 … 2500]$A_t$+... + $A_{t+11}$=0.

In the studied scenario, the annual adjustment possibility is within the limits of ± €5000 and the sum of adjustment in 3 successive years is within the limits of ± €2500. The argument against this study setup is of course that farm-based monitoring will be implemented to test whether the cash-based income statement is in line with performance-based counts, where input purchases and output sales are connected to those years when they occurred in real life. However, imperfect information is a problem and farmers have a considerable information advantage here. It would be time consuming and very expensive for state officials to judge every single input purchase and output sale on a farm. In the Canadian AgriStability programme, producers are obliged to provide information on commodity and input stock levels in order to participate in the programme. The administrative costs of the AgriStability programme are not known, but the Auditor General of Canada (2011) has criticised AgriStability because of its large administrative burden and complexity.

## 6. RESULTS

*Descriptive statistics*

The annual average of the profit margin varied on Finnish bookkeeping farms between €10 260 and €37 465 per year. The highest profit margin in average terms was obtained in 2007

and the lowest in 1998. The variation in profit margins is large, since the average profit margin in the best years has been almost quadruple that of the worst years. Large variation between farms does not explain inter-annual variation in the sample, since the group of FADN farms has remained almost constant over time (Table 1).

At the farm level, harsh climate conditions do not give possibilities for the diversification of production. There are simply not as many plant species to choose between as in more favourable areas. The other main feature is that the commodity yields and prices move independently. Thus, no natural hedge on commodity markets exists to secure farmer incomes, as in larger countries whose yields and yield expectations affect prices on world markets. The coefficient of variation for farm income at the farm level was on average terms 2.11. The observed variation is significantly larger than the measured variability in the per hectare revenues from crops in more favourable EU areas (OECD 2011).

Table 1: Profit margin without CDC compensation, 1989–2009

| Year | Mean | SD | Q1 | Q3 |
|---|---|---|---|---|
| 1998 | 10 260 | 22 737 | -2579 | 18 571 |
| 1999 | 12 222 | 27 004 | -3044 | 20 125 |
| 2000 | 20 985 | 30 046 | 2290 | 32 777 |
| 2001 | 22 982 | 37 436 | 1345 | 33 222 |
| 2002 | 14 357 | 32 123 | -4081 | 27 511 |
| 2003 | 14 011 | 33 804 | -5246 | 27 277 |
| 2004 | 14 656 | 34 082 | -4278 | 27 975 |
| 2005 | 16 090 | 38 036 | -4895 | 30 611 |
| 2006 | 21 360 | 43 634 | -3950 | 38 807 |
| 2007 | 37 465 | 52 879 | 3214 | 57 909 |
| 2008 | 35 825 | 54 193 | 1873 | 55 384 |
| 2009 | 29 743 | 56 155 | -3515 | 45 699 |

Source: own elaboration

Nominal prices. SD = standard deviation; Q1 = lower quartile (approximately 25% of the values lie below Q1); Q3 = upper quartile (approximately 75% of the values lie below Q3)

Large variation in the profit margin is due to weather shocks and price volatility. Because of the lack of a natural hedge mechanism in Finland, these variables amplify farm income variability. Comparison of CDC and IST schemes gives tools to compare the size of the effects of these variables. Table 2 lists the realised CDC and estimated IST hit rates and the sum of realised CDC and estimated IST compensation in 1998–2009. The CDC scheme only covers weather-based crop damage exceeding 30% deductible from the regional average. The results indicate that crop damage this large is reasonably systemic and has occurred to a large extent in particular years. Examples include 1998 and 1999, when on average one out of four farms faced crop damage this extensive. Unfortunately, our FADN data do not cover these years to implement the IST appropriately. IST compensation is based on a five-year average, excluding the worst and the best years. Consequently, the IST results provided in Table 2 are only reliable from 2003 onwards.

The hit rates were studied at the farm level. Each farm was entered into the IST scheme and possible indemnity payments were calculated. The total sum of compensation was calculated by weighting FADN farms to represent the total farm population in Finland. Weighting was carried out on the farm level. The results clearly indicate that the IST scheme is much larger than the CDC scheme. This is expected, since the IST also covers the price waivers, and it appears that price waivers have a larger effect on farm income than pure yield damage compensated through the CDC scheme.

Table 2: CDC and IST compensation, 1989–2009

| Year | CDC hit rate (%) | CDC compensation (million €) | IST hit rate (%) | IST compensation (million €) |
|---|---|---|---|---|
| 1998 | 24.9 | 11.6 | 0 | 0 |
| 1999 | 19.2 | 18.9 | 26.4 | 45.7 |
| 2000 | 0.6 | 0.6 | 13.0 | 24.1 |
| 2001 | 1.1 | 0.7 | 18.6 | 34.0 |
| 2002 | 1.1 | 1.9 | 37.7 | 118.4 |
| 2003 | 4.5 | 2.2 | 40.1 | 135.3 |
| 2004 | 6.0 | 9.4 | 35.5 | 116.7 |
| 2005 | 0.7 | 1.1 | 31.6 | 99.7 |
| 2006 | 5.5 | 4.0 | 23.8 | 59.1 |
| 2007 | 0.5 | 1.7 | 10.9 | 24.7 |
| 2008 | 0.9 | 2.1 | 21.8 | 87.6 |
| 2009 | 0.4 | N.A. | 36.9 | N.A. |

Source: own elaboration

The IST scheme has been triggered with a high frequency on Finnish farms. For example, in 2003 about 40% of farms triggered the IST payment. Even with the high grain prices and normal yields in 2007, one out of ten farms triggered the IST payment. This indicates that Finnish farmers have been operating in an economic environment where "normal risks" are large enough to trigger the IST. In the Canadian AgriStability programme, payments are more easily triggered, just after 15% deductible. If this low deductible was also implemented in Finland, it would lead to only a slight increase in the hit rate and the sum of compensation payments, because the variation in farm incomes is so large.

*Linear programming to reveal farmers' actions*

To predict farmers' actions under the IST, the average pig farm was studied. The results indicate that the use of the annual adjustment possibility for the profit margin would have increased farmers' profits under IST in 1998–2009. The net profit would have increased even when using small annual adjustment quantities that sum up to zero over time.

When a pig farmer maximises the profits under the IST, it is profitable to adjust the economic result of the weakest years to be even weaker. It is also profitable to reduce the economic results in years with the highest profits to the limit at which these years are "dropped"

in the reference margin calculation. This builds up the adjustment capacity to increase the profits in those years that are used to calculate the reference margin (Table 3). A high reference margin could be considered as a stock or buffer to be realised in bad years (Table 3).

In the pig farm case, individual farmers received payments from the IST totalling €16 889 during 1998–2009. IST payments were triggered in 2003 and 2008. In 2003 the IST payment was €10 395 and in 2008 €6494. The farmer's overall profit margin increased from €470 905 to €485 333. The profit margins of these years before adjustment are well below the reference margin, and the farmer's actions increase the IST payments. The obtained results reveal that there is a clear incentive for moral hazard in the IST. Farmers could easily manipulate their economic results merely through the timing of their input purchases and output sales. The adjustment capability of 10% of the annual profit margin makes farmers net receivers from the IST. Profits summed from 1998–2009 increase by €14 428. Thus, the net costs from the IST would become negative. However, the IST manages to smooth income waivers (Table 3).

Table 3: Pig farm profit margin, adjustment and IST payments 1998–2009

| Year | Profit margin | Adjustment | Profit margin + Adjustment | IST payment | IST cost for farmer[1] | Profit margin + Adjustment + IST payment - IST cost | reference margin |
|---|---|---|---|---|---|---|---|
| 1998 | 22 700 | -2 500 | 20 200 | 0 | 132 | 20 067 | |
| 1999 | 34 234 | 5 000 | 39 234 | 0 | 205 | 39 029 | 20 200 |
| 2000 | 52 990 | -4 105 | 48 885 | 0 | 242 | 48 643 | 29 717 |
| 2001 | 47 280 | 1 605 | 48 885 | 0 | 242 | 48 643 | 36 106 |
| 2002 | 35 488 | 5 000 | 40 488 | 0 | 210 | 40 278 | 45 668 |
| 2003 | 20 158 | -5 000 | 15 158 | 10 395 | 113 | 25 440 | 42 869 |
| 2004 | 40 529 | 2 500 | 43 029 | 0 | 220 | 42 809 | 42 869 |
| 2005 | 36 509 | 0 | 36 509 | 0 | 195 | 36 314 | 44 134 |
| 2006 | 36 939 | 0 | 36 939 | 0 | 196 | 36 314 | 40 008 |
| 2007 | 62 176 | 2 500 | 64 676 | 0 | 302 | 64 373 | 37 978 |
| 2008 | 22 901 | -5 000 | 17 901 | 6 494 | 123 | 24 271 | 38 825 |
| 2009 | 59 003 | 0 | 59 003 | 0 | 281 | 58 723 | 38 825 |
| ∑1998-2009 | 470 905 | 0 | | 16 889 | 2 461 | 485 333 | |

Source: own elaboration

[1]Farmers pay a basic payment of €55 and 85% of 0.45%* adjusted profit margin. This structure is similar to that in the Canadian AgriStability programme. However, the calculated costs do not cover 35% of the overall IST costs under Finnish conditions.

The trampoline effect comes from the rule of thumb for the farmer. When insured by the IST, farmers should always try to manipulate their profit margin downwards in below-average years. In the best years, the adjustment capacity should be built up, but these years should remain dropped from the calculation of the reference margin. When confronted with a really large drop in the profit margin, farmers should take their money out of the IST. The extreme

case where profit margins are constant over time gives a more general hint. With constant profit margins over time, insured farmers could never receive IST payments in the form of indemnity payments.

## 7. CONCLUSIONS

Farmers have formal and informal measures to smooth income waivers. These tools typically become mixed under yield and income insurance schemes such as the IST. The basis for farmers' actions is an attempt at profit maximization in the long term. Farmers have more information about individual farm incomes than the state officials running the IST. By using this advanced information, farmers insured under the IST could obtain some cover against income waivers for free.

The IST is designed to smooth income waivers. Indemnity payments are triggered only if the profit margin drops enough on an individual farm. This does not leave room for farmers' informal measures to smooth income waivers, but encourages the opposite behaviour. Our results show that the income variation is large on Finnish farms. When comparing the current CDC scheme and the IST, it seems that the smaller part of the variation comes from yield variation and the larger part from the price volatility. Thus, farmers also need other possibilities than yield insurances to prepare them against income volatility.

From the farmers' point of view, the IST provides possibilities to smooth income variability, while it also increases the mean income. However, the farmer must first amplify the income waivers by timing the input purchases and output sales. This trampoline effect shakes the benefits for the farmer from the IST.

As shown with the linear programming model, farmers could use the IST as an income transfer policy rather than an effective risk management tool. However, the efficiency of the IST as an income transfer policy is questionable due to its large transaction costs. It is evident that before the IST is applied in Finland, it will be important to reveal the moral hazard linked to the risk management tool. Thus, more research is needed on attitudes among Finnish farmers towards risk and risk management tools.

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