

# A regional analysis of income risk in Swiss agriculture

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# Content

- Motivation & Research Questions
- Background on Swiss Agriculture Policy
- Data and Sampling Procedure
- Empirical approach
- Hypotheses
- Results
- Conclusion

## Motivation

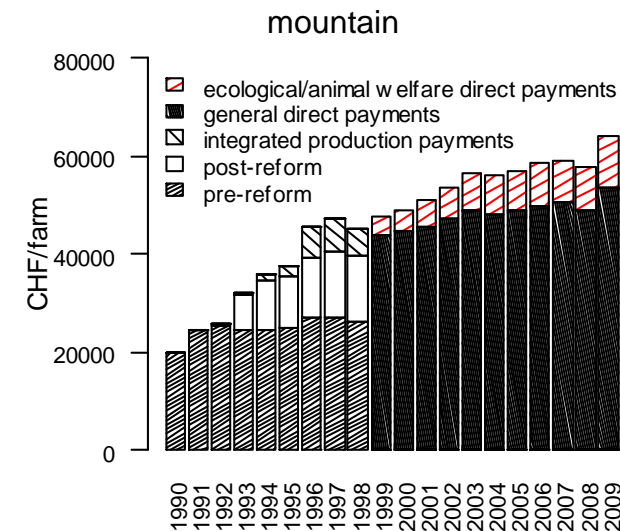
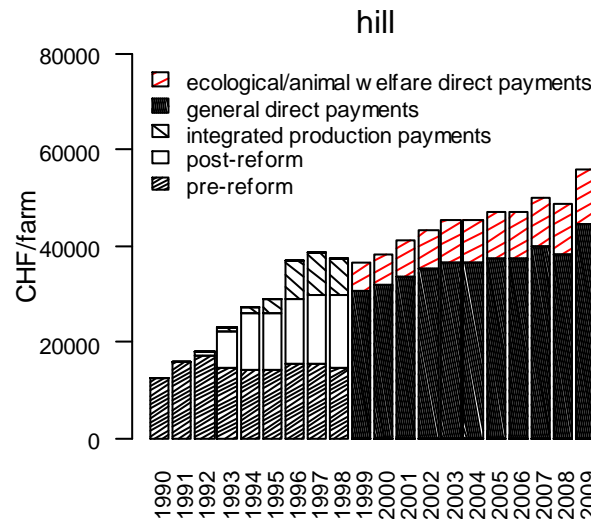
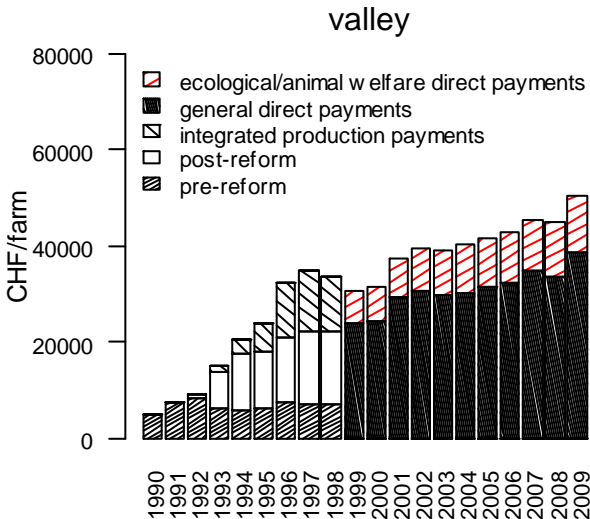
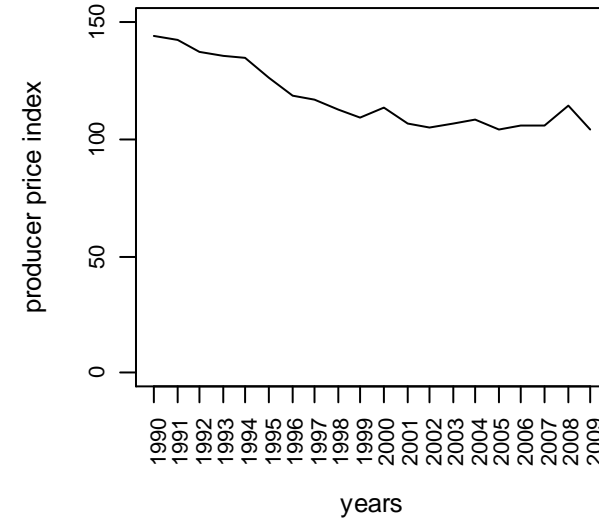
- Change from market-based support to decoupled direct payments based on cross-compliance
  - increase in price volatility?
  - increase in production risk?
  - increase in income risk?
- First explorative empirical analysis on changing income risks

## Research Questions

- How did income risk change over time?
- Are there differences between gross farm revenue and household income risk?
- How do direct payments and farm characteristics affect income risk?

# Swiss agricultural policy

- 1st reform 1992: Introduction direct payments
- 2nd reform 1999: cross-compliance
- Compensate farmers for adverse production conditions



## Data and Sampling Procedure

- Unbalanced Swiss farm accountancy data (FADN) 1992 – 2009
- Risk: CV for deflated gross farm revenues and household income
- **Moving average approach**
  - split the time period 1992-2009 into 14 overlapping 5-year time intervals:  
1992-1996, 1993-1997, 1994-1998, ..., 2005-2009
  - for the 1st interval choose those farmers with data entries for each of the 5 years, do the same for the remaining intervals
  - calculate the CV for each farm and each time interval

	total	valley	hill	mountain
Observations	23261	10314	6843	6104
farms	4513	2105	1340	1148

## Empirical approach

### Measuring changes in the coefficients of variation

- Non-parametrical tests to test for:
  - significant differences between regions
  - significant differences at different points in time (1992/96; 1998/2002; 2005/09)
- Linear panel regression models to test for significant time trends

### Estimation of the effects of farm characteristics on income risk

- Fixed effect panel regression with autocorrelated error-terms:

$$Y_{it} = \beta x_{it} + u_i + e_{it}$$

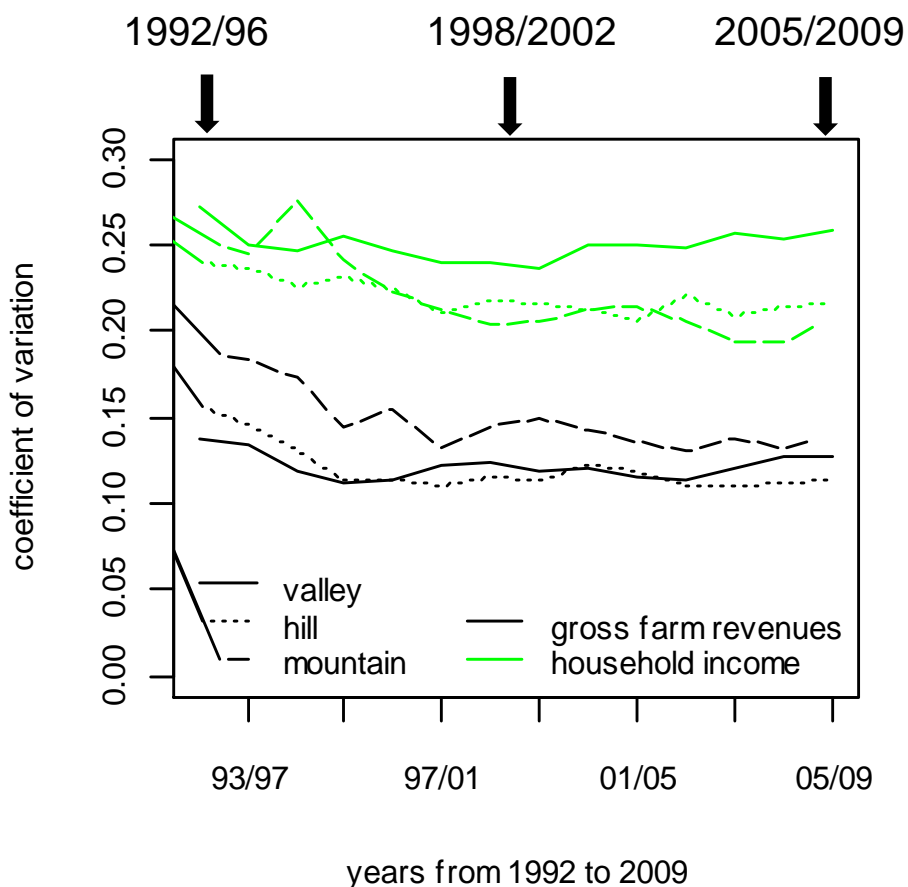
- $u_i$  = farm-specific error term (autocorrelated)
- $e_{it}$  = idiosyncratic error term

## Hypotheses

Variables	Expected effect on income risk	Definition	Reference
Specialisation	pos	Herfindahl Index	Barnett and Coble (2009)
Off-farm income	pos/neg	Off-farm income / household income	OECD (2003), Blank and Erickson (2007)
Direct payments	pos/neg	Direct payments / total revenues	Isik (2002), Finger (2012), Schläpfer et al. (2002), Serra et al. (2005)
Farm size	neg	Total Assets in CHF	Yee et al. (2004), Marra and Schurle (1994)
Liquidity	pos	Fixed assets / total assets	Barry et al. (1988)
Region	differences	1=valley, 2=hill, 3=mountain	

$$\text{Herfindahl Index} = \frac{\text{arable crops}^2 + \text{permanent crops}^2 + \text{rest plant}^2 + \text{milk}^2 + \text{cattle}^2 + \text{nonruminants}^2 + \text{rest animals}^2}{\text{total agricultural gross revenues}^2}$$

## Results – Coefficients of variation for gross farm revenues and household income in the valley, hill and mountain region



Non-parametrical tests results:

- Significant differences of income risk between regions in the first and last time period but convergence (divergence)
- Significant decreases in income risk from 1<sup>st</sup> to 2<sup>nd</sup> reform step for all regions

Linear panel-regression results:

- Significant negative time trend for gross farm revenues and household income for each region (except for household income in the valley regions)



## Results – The effect of farm characteristics on gross farm revenue risk

	all	valley	hill	mountain
Specialisation	+ <sup>***</sup>	+ <sup>***</sup>	+ <sup>***</sup>	+ <sup>***</sup>
Off-farm income	+	+ <sup>***</sup>	-*	+
Direct payments	- <sup>***</sup>	- <sup>***</sup>	- <sup>***</sup>	+ <sup>***</sup>
Farm size	- <sup>***</sup>	-	- <sup>***</sup>	- <sup>***</sup>
Financial immobility	+	+	+	+
Hill	-			
Mountain	+ <sup>***</sup>			

\*, \*\*, \*\*\* significance at the 10%, 5%, 1% level

## Results – The effect of farm characteristics on household income risk

	all	valley	hill	mountain
Specialisation	+ <sup>***</sup>	+ <sup>***</sup>	+ <sup>*</sup>	+ <sup>***</sup>
Off-farm income	- <sup>***</sup>	- <sup>***</sup>	- <sup>**</sup>	+
Direct payments	- <sup>***</sup>	- <sup>***</sup>	- <sup>***</sup>	- <sup>***</sup>
Farm size	+ <sup>***</sup>	+ <sup>***</sup>	+ <sup>***</sup>	-
Financial immobility	+ <sup>***</sup>	+ <sup>***</sup>	+ <sup>*</sup>	+ <sup>***</sup>
Hill	- <sup>***</sup>			
Mountain	+			

<sup>\*</sup>, <sup>\*\*</sup>, <sup>\*\*\*</sup> significance at the 10%, 5%, 1% level

## Summary and Conclusion I

- Agricultural policy changes decreased income risk of Swiss farmers
  - 1st reform step stronger effect than 2nd reform step
  - strongest stabilisation effect in the mountain regions
- Direct payments decrease gross farm revenue and household income risk
  - differences between regions must be further analysed
- Trade-off between different management strategies, e.g. valley farms
  - increase farm size & enter into full-time farming reduces revenue risk but increase household income risk

## Summary and Conclusion II

- Implications for insurance solutions
  - take off-farm income, farm size, and degree of specialisation into account
  - adverse selection: small and specialised farmers with high off-farm income might be more likely to use revenue insurance
  - direct payments serve as insurance for farmers: crowding out of other risk management strategies/instruments, governmental intervention needed?
  
- Future research
  - what is farmers' goal function: revenues or household income?
  - explain different effects of direct payments between regions
  - detailed analyses on sources of income risk for different farm types

# Thanks for your attention!

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