Economic robustness of German dairy farms
A case study of the milk crisis 2015 and 2016

Eva-Charlotte Weber and Heiko Hansen
Thünen Institute of Farm Economics

29th PACIOLI-workshop
Montegrotto, Italy
6-9 October 2024

Outline

Background and motivation

Methodological approach

- Definition and measurement of economic robustness
- Categorisation of farms into ‘robustness classes’

Data basis

- German FADN data

Results

- Income developments in the ‘robustness classes’ and its causes

Discussions of the results, conclusions and outlook

Background and motivation
Pacioli 2023

THÜNEN

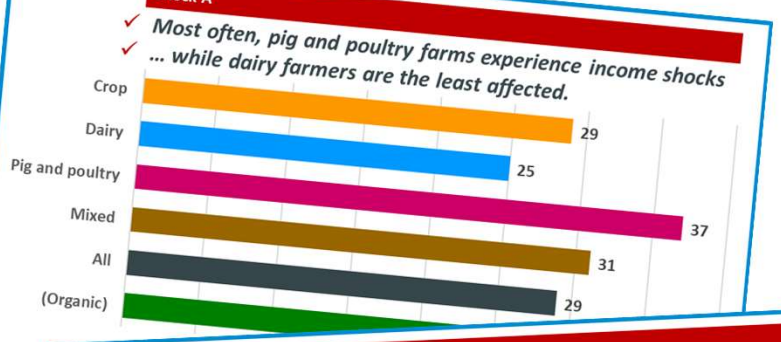
How resilient are farms in Germany?
An ex-post analysis of accountancy data

Heiko Hansen and Eva-Charlotte Weber
Thünen Institute of Farm Economics

28th PACIOLI-workshop
Ptuj, Slovenia
1-4 October 2023

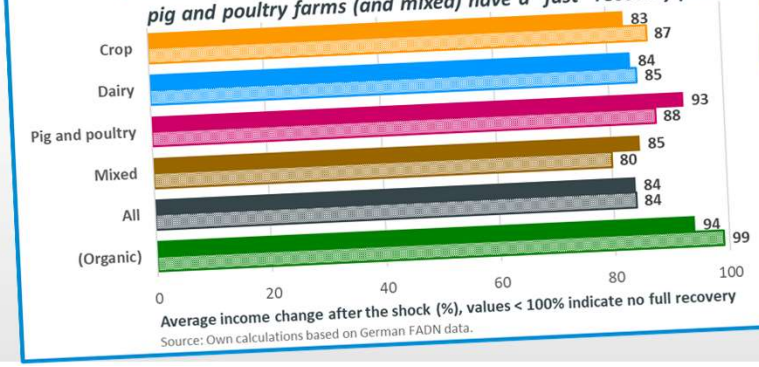
Shock A

- ✓ *Most often, pig and poultry farms experience income shocks*
- ✓ *... while dairy farmers are the least affected.*



Recovery rate B
Recovery rate C

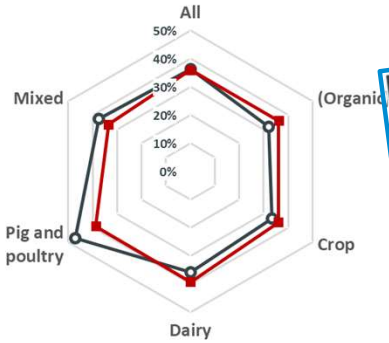
- ✓ *Income recovery tend to be a bit higher in pig and poultry farms (and these farm type is most often affected by income shocks).*
- ✓ *Crop farms (and organic) show more a "slow" recovery pattern, pig and poultry farms (and mixed) have a "fast" recovery pattern.*



Source: Own calculations based on German FADN data.

Recovery rate B (share of farms recovering fully)
Recovery rate C (share of farms recovering fully)

- ✓ *Between 30 to 40% of the farms have fully recovered after an income shock (pig and poultry almost 50%)*



Source: Own calculations based on German FADN data.

	Subperiod 1 2002 to 2011	Subperiod 2 2012 to 2021	Whole period
Resistance *Income decrease → I_t vs. I_{t-1}*	42%	46%	44%
Shock A *Share of farms → I_t vs. I_{t-1}*	27%	30%	29%
Shock B *Share of farms → I_t vs. $I_{t-1\ to\ t-3}$*	23%	33%	27%
Recovery rate A *Income change → I_{t+1} vs. I_{t-1}*	77%	67%	73%
Recovery rate B *Income change → I_{t+1} vs. $I_{t-1\ to\ t-3}$*	90%	76%	84%
Recovery rate C *Income change → $I_{t+1\ to\ t+3}$ vs. $I_{t-1\ to\ t-3}$*	96%	73%	84%

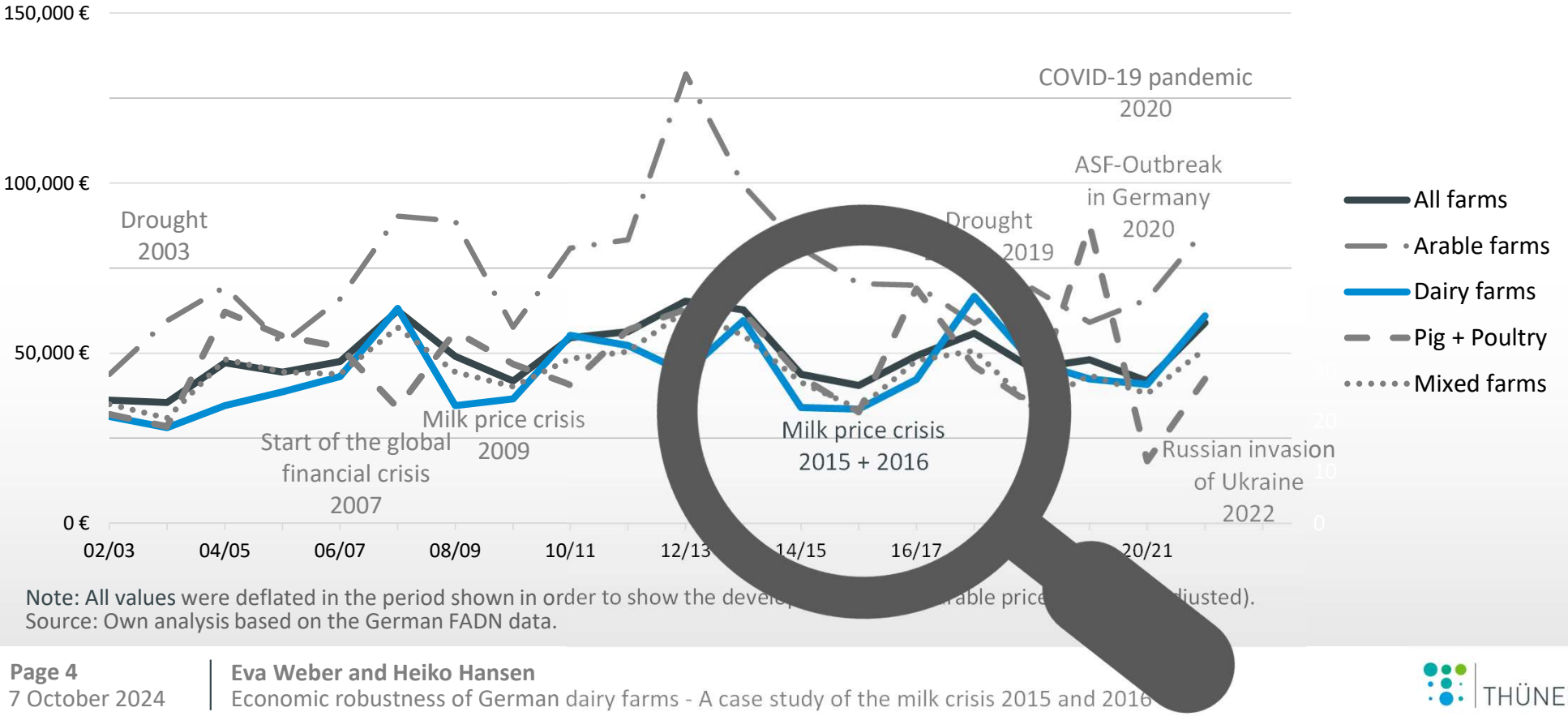
Background and motivation
Pacioli 2023

Main findings presented:

- Pig and poultry farms are most frequently affected by "*income shocks*" (here, defined as income drops of more than 30 %).
  At the same time, they show a comparatively strong income recovery.
- Approximately two thirds of farms do not recover fully from an *income shock* in the short (one year after) or medium term (three years after).
- Comparing the two analysed decades, the frequency of *income shocks* has tended to increase while the recovery *capacity* of farms has tended to decrease
  … or have adverse events occurred more frequently and/or more severely?
- For further details: check out our last year's slides (*link*) ☺

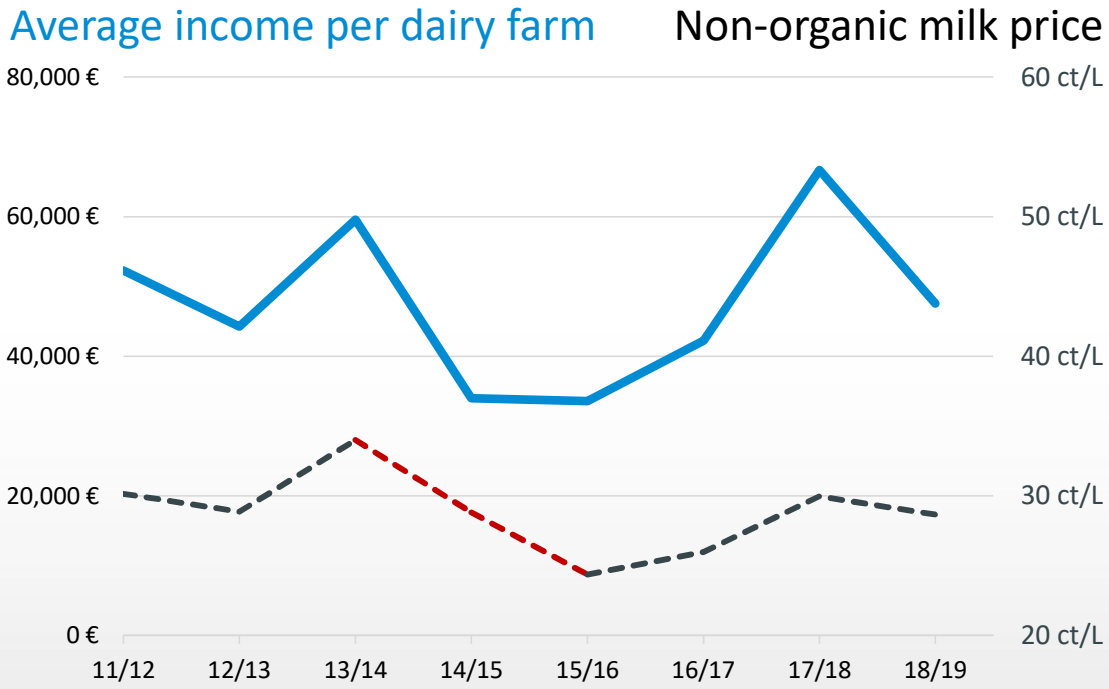
Background and motivation
Pacioli 2024: Case study milk price crisis

Average income per farm (€)



Note: All values were deflated in the period shown in order to show the deve… …able price… …djusted).
Source: Own analysis based on the German FADN data.

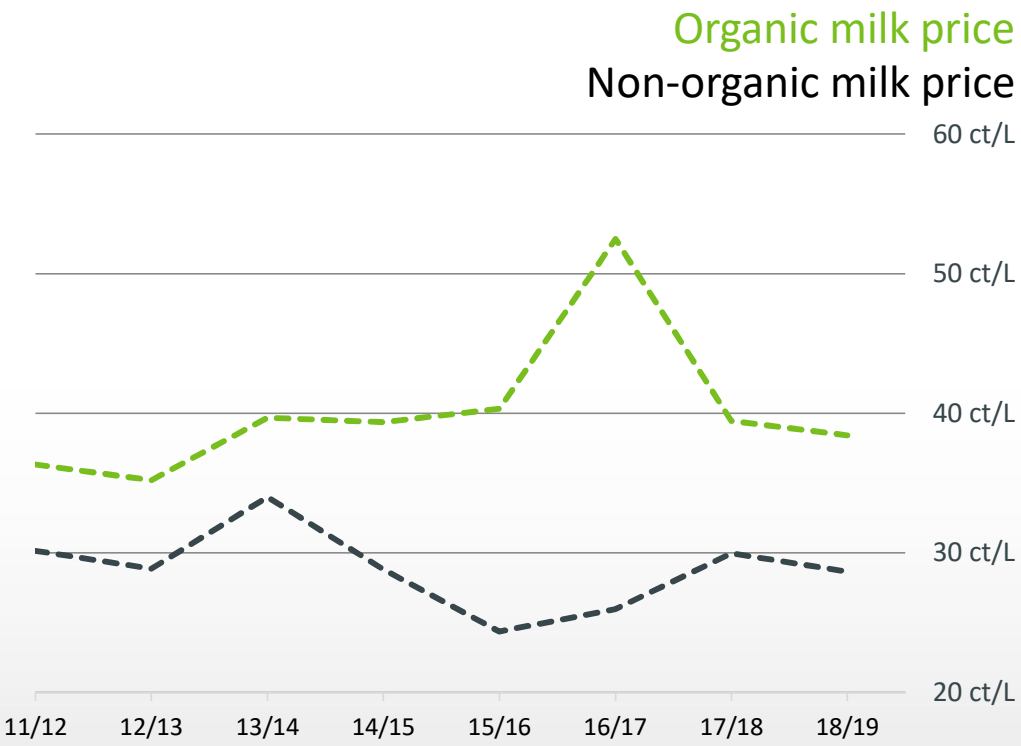
Background and motivation
Milk price crisis 2015 and 2016



- AY 2014/15: ¾ of the German FADN dairy farms experienced an income drop compared to the three-year pre-crisis income.
- Observed drop in milk price by -10 ct/L (-28 %) within two years
  - AY 2013/14: 34 ct/L
  - AY 2015/16: 24 ct/L

Note: All values were deflated in the period shown in order to show the development at comparable prices (inflation-adjusted).
Source: Own analysis based on the German FADN data.

Background and motivation
Milk price crisis 2015 and 2016



- Organic milk price not affected
- (Non-organic farms affected heterogeneously due to different supply contracts).

Note: All values were deflated in the period shown in order to show the development at comparable prices (inflation-adjusted).
Source: Own analysis based on the German FADN data.

Methodological approach
Economic farm resilience

European Review of Agricultural Economics Vol **49 (1)** (2022) pp. 121–150
doi:https://doi.org/10.1093/erae/jbab042
Advance Access Publication 13 October 2021

Quantifying the resilience of European farms using FADN

Thomas Slijper[†,‡,*], **Yann de Mey**[†], **P. Marijn Poortvliet**[‡] **and Miranda P. M. Meuwissen**[†]

[†]*Business Economics, Wageningen University & Research, The Netherlands;* [‡]*Strategic Communication, Wageningen University & Research, The Netherlands*

According to Slijper et al. (2022) farm resilience comprises the capacities of

i. Robustness

→ extent of income drops, income shocks and income recovery rate

ii. Adaptability

→ Changes in farming practices, output and input composition (and intensity)

iii. Transformability

→ Major shifts in farm structure (changing farm type, switching to part-time farming, converting to organic farming or developing other gainful activities)

Methodological approach
Economic farm robustness

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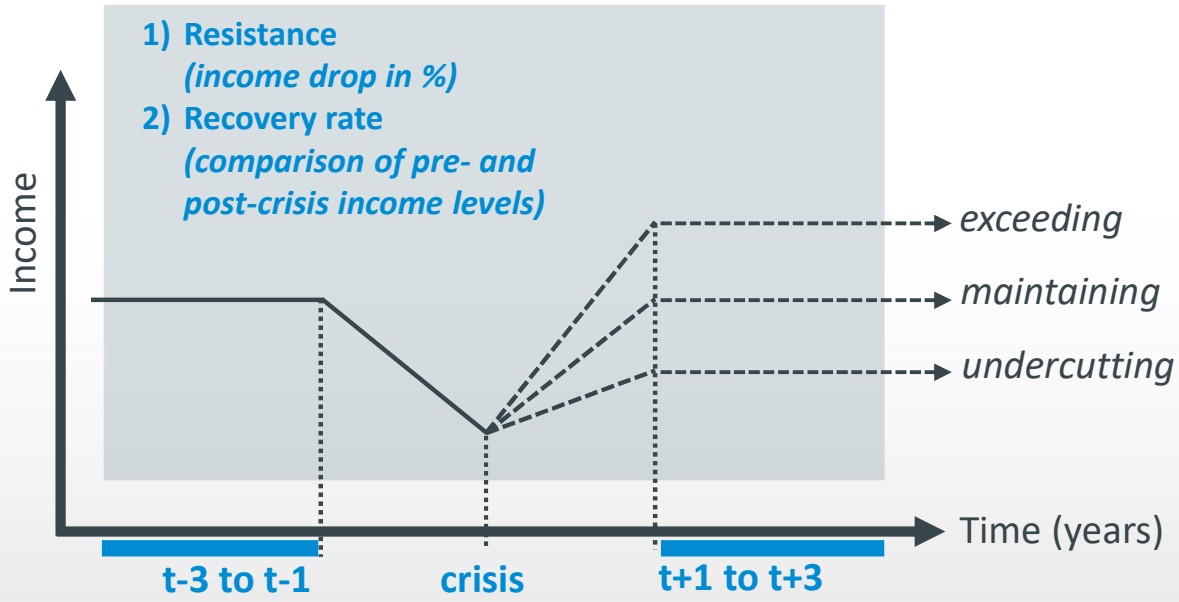
Adapted from Slijper et al. (2022), two robustness indicators were calculated:



Source: According to Sauer (2022), Slijper et al. (2022) and Conway et al. (2010).

Methodological approach
Robustness classes

ZFW – Advances in Economic Geography 2022; 66(2): 96–110

Christian Hundt* and Lennart Grün

Resilience and specialization – How German regions weathered the Great Recession

Based on Hundt und Grün (2022):

- Calculation of individual and sample means of:
  - *resistance* in milk crisis
  - *recovery rate* after milk crisis
- Categorisation of the farms into five ‘robustness classes’,
  - by comparing individual to sample average of *resistance* and *recovery rate*:

→ Robust farms: no drop in income during crisis

→ Resistance: high ↔ low

→ Recovery: strong ↔ weak

Robust farms
1

Non-robust farms		
High resistance	***Low resistance***	
2	4	***Strong recovery***
3	5	***Weak recovery***

- Exclusion of farms whose *resistance* and *recovery rates* are close to the mean value of the sample (sample mean ± 2.5 %)

Data basis

Farm accountancy data

- German FADN includes approximately 8,000 farms per year (⚠ but declining number)

Observation period

- Accountancy years 2011/12 to 2018/19 (3 pre-crisis, 2 crisis, 3 post-crisis years)

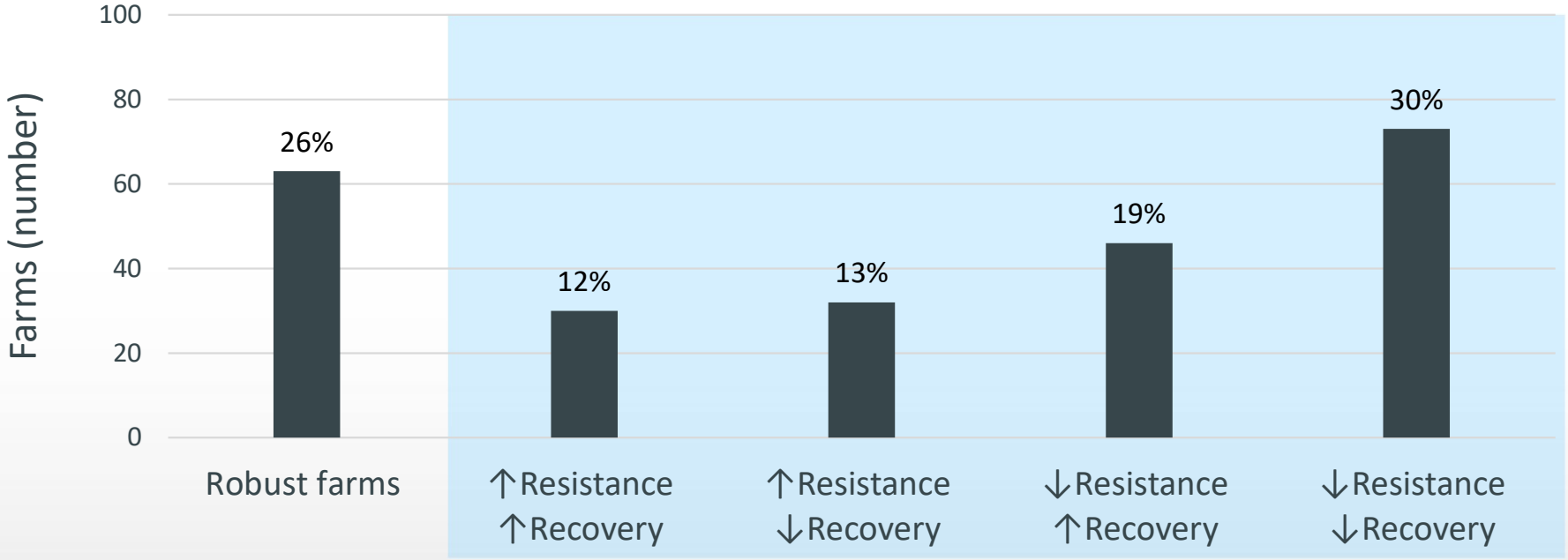
Sample selection

- Full-time family farms (expecting agricultural income to be primary income source)
- Non-organic farms (as organic milk market was not affected)
- Same ('identical') farms (analysing farm developments without distortion due to changes in sample, ⚠ farm exit can not be considered)

→ 244 conventional dairy farms that are categorized into five 'robustness classes'

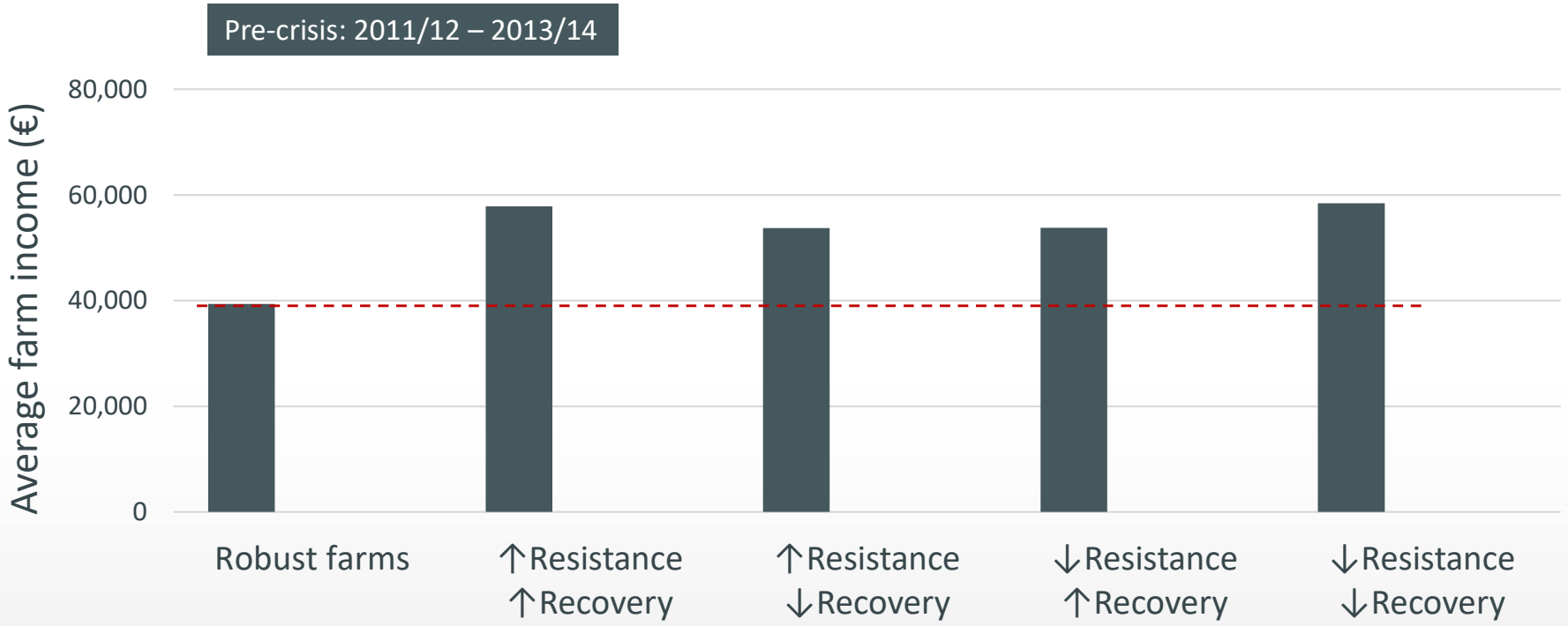
Selected results (i)
Robustness classes – sample

→ 244 conventional dairy farms categorized into five ‘robustness classes’



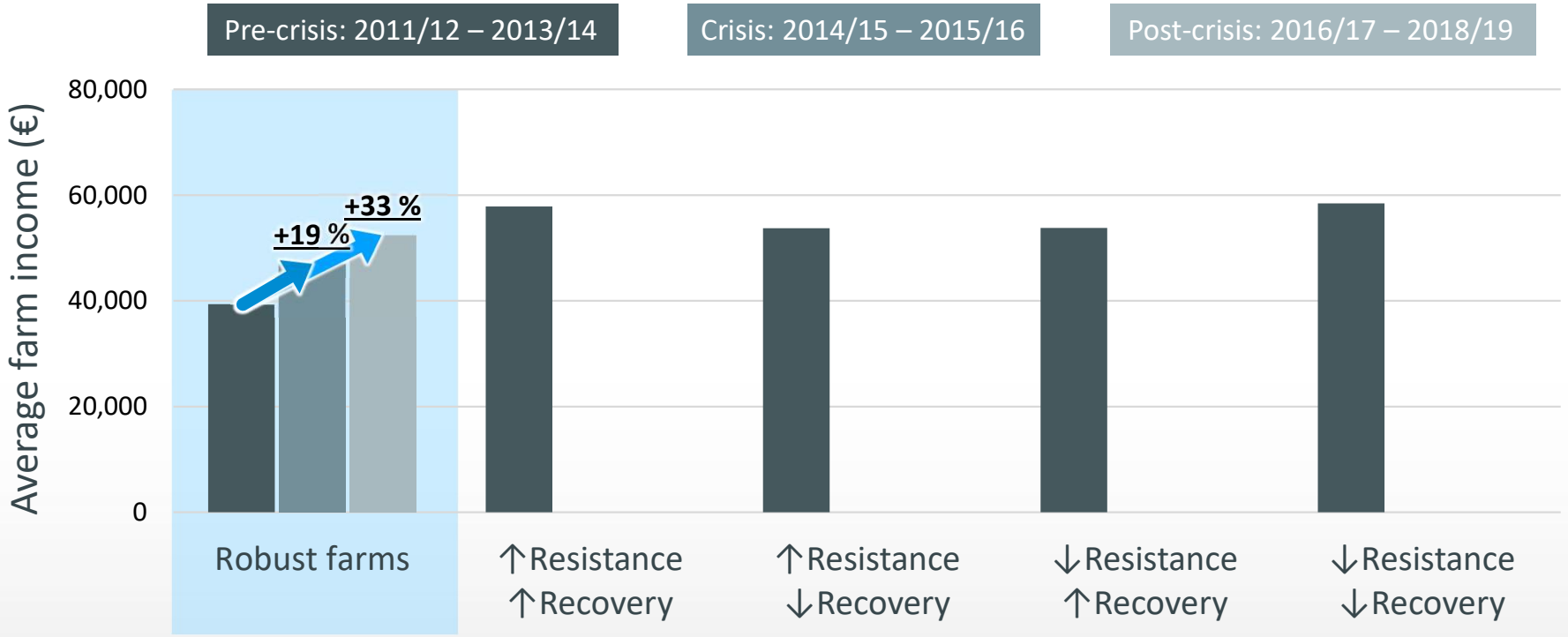
- ¾ of the farms analysed experienced a decline in income during crisis.

Selected results (ii)
Robustness classes – income development (i)



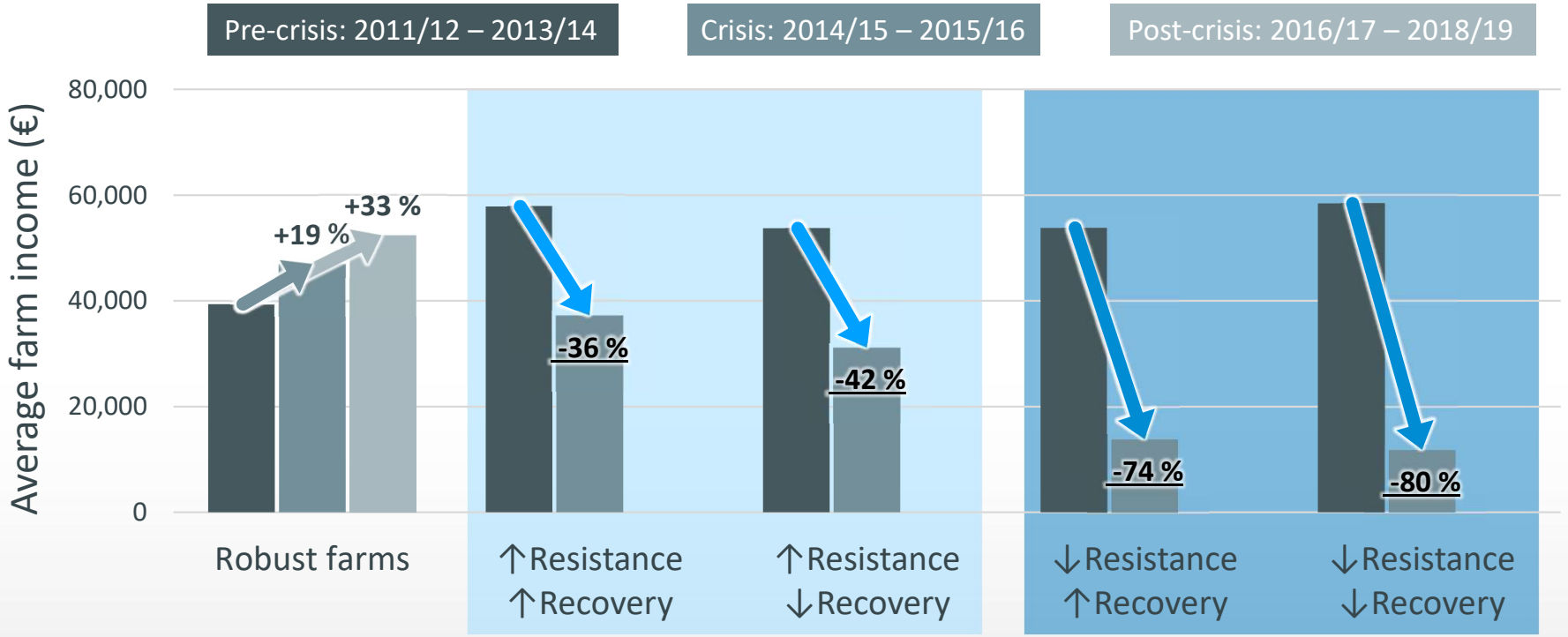
- Robust farms show the lowest average farm income before the crisis.

Selected results (ii)
Robustness classes – income development (ii)



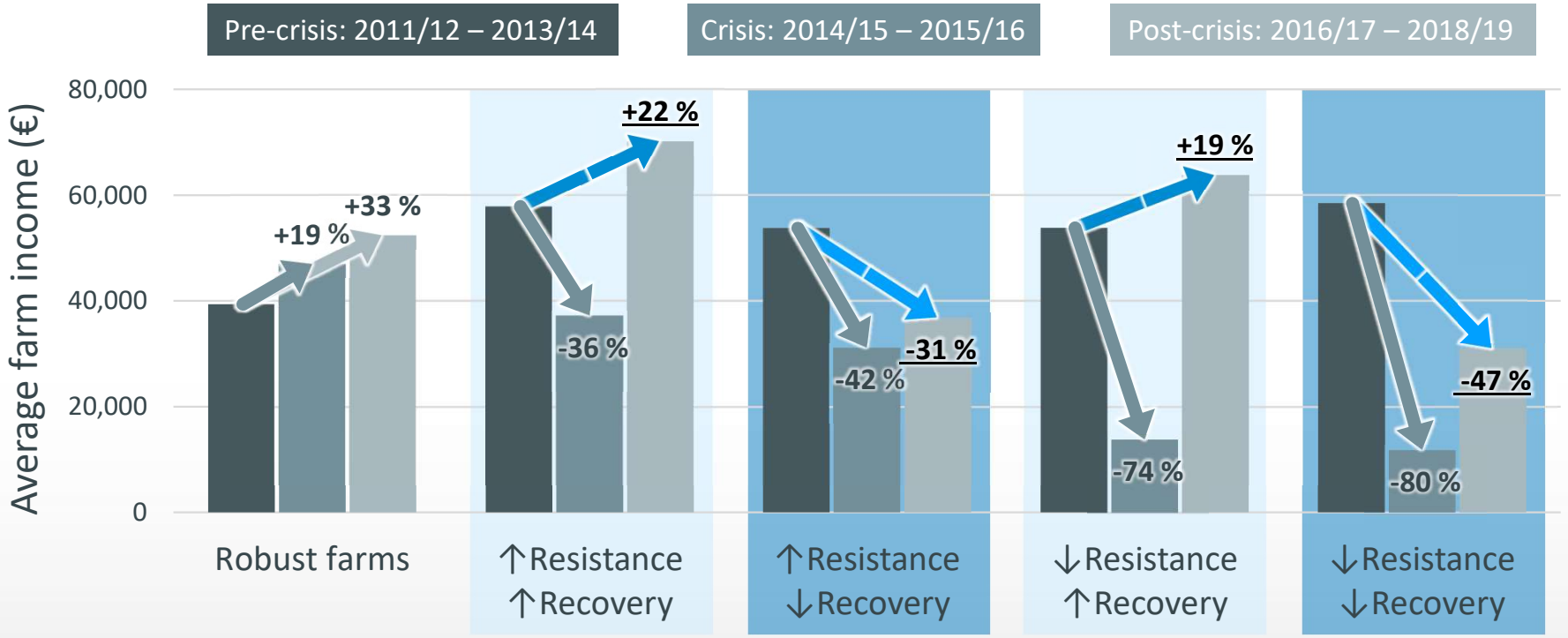
- Robust farms increase the average farm income during and after the crisis.

Selected results (ii)
Robustness classes – income development (iii)



- Income drops in farms with a low resistance are on average twice as high as in farms with a high resistance.

Selected results (ii)
Robustness classes – income development (v)

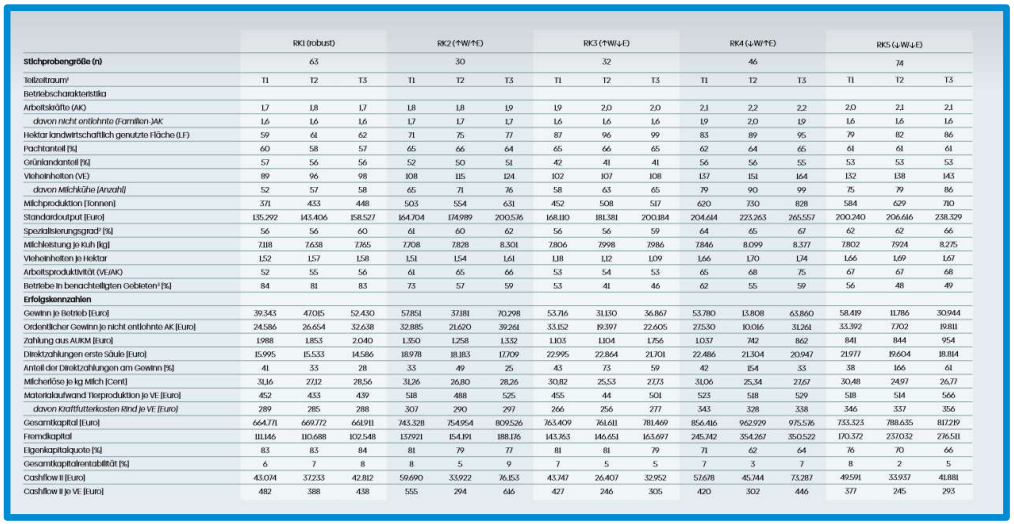


- Farms with a strong recovery do on average exceed pre-crisis income levels after crisis – in contrast to farms with a low recovery.

Selected results (iii)
Robustness classes - causes of different income dynamics (i)

- Descriptive analysis using more than 30 indicators covering
  - → farm characteristics,
  - → adaptations and changes,
  - → performance indicators (liquidity, stability and profitability)

to investigate the differences and similarities between the five ‘robustness classes’

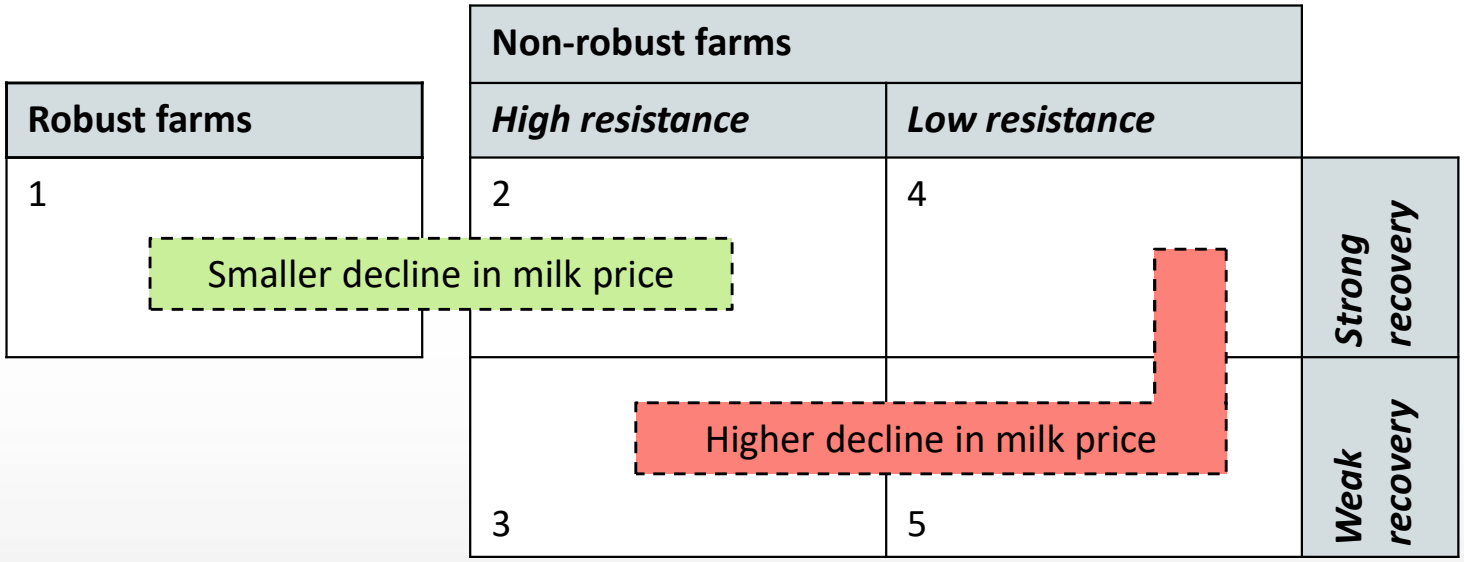


	RK1 (robust)			RK2 (↑W/↑E)			RK3 (↑W/↓E)			RK4 (↓W/↑E)			RK5 (↓W/↓E)		
Stichprobengröße (n)	63			30			32			46			74		
Teilzeitraum²	T1	T2	T3	T1	T2	T3	T1	T2	T3	T1	T2	T3	T1	T2	T3
Betriebscharakteristika															
Arbeitskräfte (AK)	1,7	1,8	1,7	1,8	1,8	1,9	1,9	2,0	2,0	2,1	2,2	2,2	2,0	2,1	2,1
davon nicht entlohnte (Familien-)AK	1,6	1,6	1,6	1,7	1,7	1,7	1,6	1,6	1,6	1,9	2,0	1,9	1,6	1,6	1,6
Hektar landwirtschaftlich genutzte Fläche (LF)	59	61	62	71	75	77	87	96	99	83	89	95	79	82	86
Pachtanteil [%]	60	58	57	65	66	64	65	66	65	62	64	65	61	61	61
Grünlandanteil [%]	57	56	56	52	50	51	42	41	41	56	56	55	53	53	53
Viehbehalten (VE)	89	96	98	108	115	124	102	107	108	137	151	164	132	138	143
davon Milchkühe (Anzahl)	52	57	58	65	71	76	58	63	65	79	90	99	75	79	86
Milchproduktion [Tonnen]	371	433	448	503	554	631	452	508	517	620	730	828	584	629	710
Standardoutput [Euro]	135.292	143.406	158.527	164.704	174.989	200.576	168.110	181.381	200.184	204.614	223.263	265.557	200.240	206.616	238.329
Spezialisierungsgrad³ [%]	56	56	60	61	60	62	56	56	59	64	65	67	62	62	66
Milchleistung je Kuh [kg]	7.118	7.638	7.765	7.708	7.828	8.301	7.806	7.998	7.986	7.846	8.099	8.377	7.802	7.924	8.275
Viehbehalten je Hektar	1,52	1,57	1,58	1,51	1,54	1,61	1,18	1,12	1,09	1,66	1,70	1,74	1,66	1,69	1,67
Arbeitsproduktivität (VE/AK)	52	55	56	61	65	66	53	54	53	65	68	75	67	67	68
Betriebe in benachteiligten Gebieten⁴ [%]	84	81	83	73	57	59	53	41	46	62	55	59	56	48	49
Erfolgskennzahlen															
Gewinn je Betrieb [Euro]	39.343	47.015	52.430	57.851	37.181	70.298	53.716	31.130	36.867	53.780	13.808	63.860	58.419	11.786	30.944
Ordentlicher Gewinn je nicht entlohnte AK [Euro]	24.586	26.654	32.638	32.885	21.620	39.261	33.152	19.397	22.605	27.530	10.016	31.261	33.392	7.702	19.811
Zahlung aus AUKM [Euro]	1.988	1.853	2.040	1.350	1.258	1.332	1.103	1.104	1.756	1.037	742	862	841	844	954
Direktzahlungen erste Säule [Euro]	15.995	15.533	14.586	18.978	18.183	17.709	22.995	22.864	21.701	22.486	21.304	20.947	21.977	19.604	18.814
Anteil der Direktzahlungen am Gewinn [%]	41	33	28	33	49	25	43	73	59	42	154	33	38	166	61
Milcherlöse je kg Milch [Cent]	31,16	27,12	28,56	31,26	26,80	28,26	30,82	25,53	27,73	31,06	25,34	27,67	30,48	24,97	26,77
Materialaufwand Tierproduktion je VE [Euro]	452	433	439	518	488	525	455	44	501	523	518	529	518	514	566
davon Kraftfutterkosten Rind je VE [Euro]	289	285	288	307	290	297	266	256	277	343	328	338	346	337	356
Gesamtkapital [Euro]	664.771	669.772	661.911	743.328	754.954	809.526	763.409	761.611	781.469	856.416	962.929	975.536	733.523	788.635	817.219
Fremdkapital	111.146	110.688	102.548	137.921	154.191	188.176	143.763	146.651	163.697	245.742	354.267	350.522	170.372	237.032	276.511
Eigenkapitalquote [%]	83	83	84	81	79	77	81	81	79	71	62	64	76	70	66
Gesamtkapitalrentabilität [%]	6	7	8	8	5	9	7	5	5	7	3	7	8	2	5
Cashflow II [Euro]	43.034	37.233	42.812	59.690	33.922	76.153	43.747	26.407	32.952	57.678	15.744	73.287	49.591	33.937	41.881
Cashflow II je VE [Euro]	482	388	438	555	294	616	427	246	305	420	302	446	377	245	293

✓ Effects found do overlap and the interplay is complex.

Selected results (iii)
Robustness classes - causes of different income dynamics (ii)

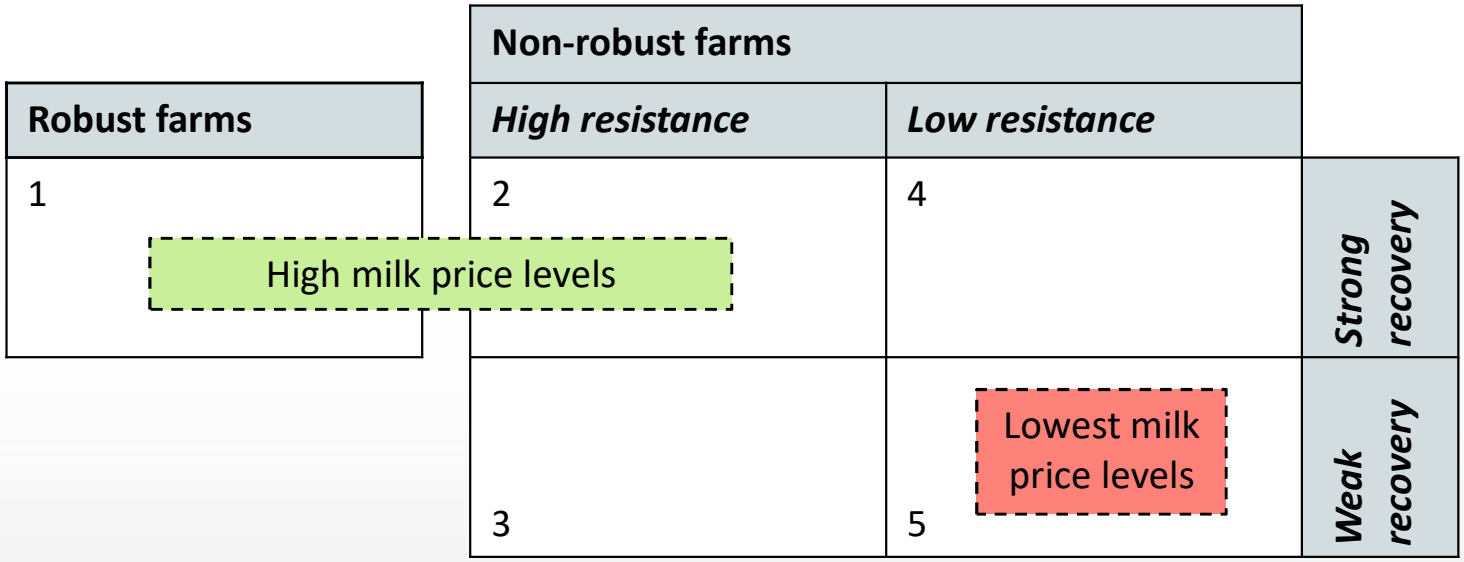
Extent of *milk price decline* (during crisis):



✓ The *milk price decline* is on average lower in those classes that are coming comparatively well through the crisis (robust, highly resistant - strongly recovered).

Selected results (iii)
Robustness classes - causes of different income dynamics (iii)

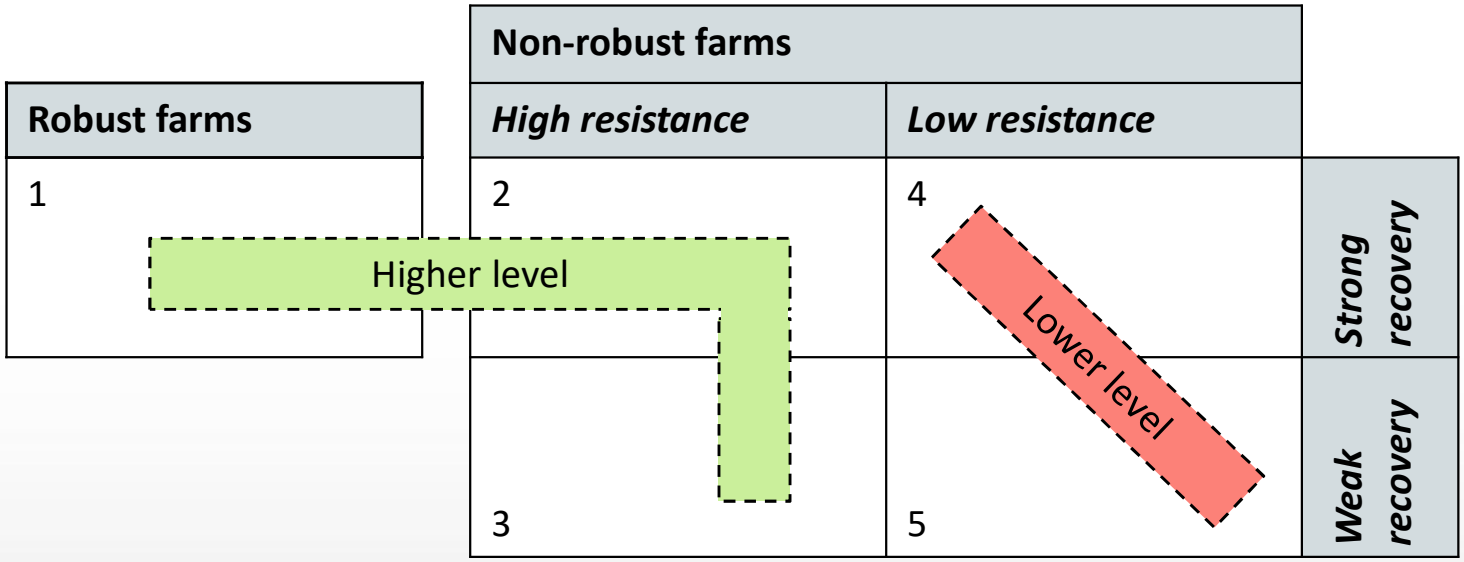
Level of *milk price* (before and after crisis):



✓ The *milk price level* also tends to be higher in those classes that are coming comparatively well through the crisis (robust, highly resistant - strongly recovered).

Selected results (iii)
Robustness classes - causes of different income dynamics (iv)

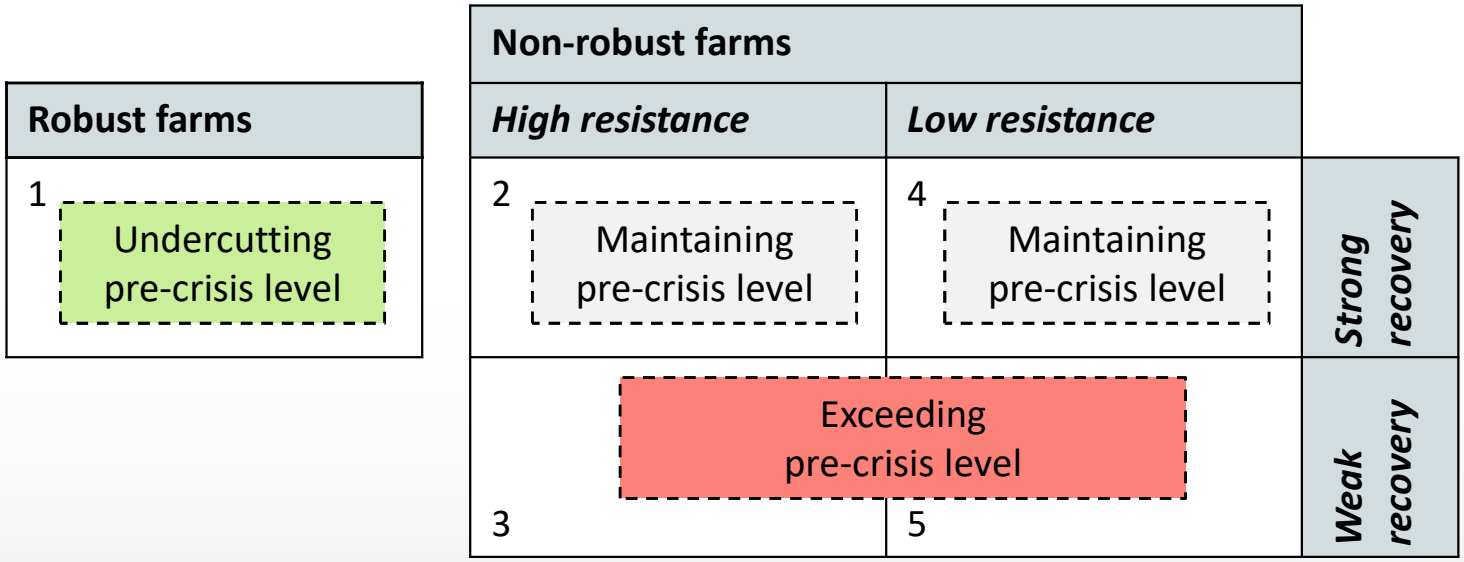
Level of *equity ratio* (before, during and after crisis):



✓ Robust farms and those with a high resistance tend to operate at higher *equity ratios*.

Selected results (iii)
Robustness classes - causes of different income dynamics (v)

Level of *costs for animal production per cow* (after crisis):



✓ Farms with a weak recovery classes tend to have increased their *costs for animal production per cow* after the crisis compared to the pre-crisis level.

Selected results (iii)
Robustness classes - causes of different income dynamics (vi)

- All ‘robustness classes’ tended to:
  - → experience milk price drops,
  - → increase their milk production by increasing the herd size and the per-cow milk yield.
- Those dairy farms that were robust or had a high level of resistance during the crisis tended to:
  - → have lower declines in milk price at a higher overall price level,
  - → be less specialised and
  - → operate at a higher equity ratio.
- Those dairy farms showing strong recoveries after crisis tended to:
  - → increase their milk production above average and
  - → maintain animal production costs per cow at pre-crisis levels.

Discussions of the results, conclusions and outlook

- Certain (key) information is not included in German FADN:
  - → Reasons for sample exits, management capacities, forage qualities, supply contracts etc.
- The analysis covers the three-year period after the crisis.
  - → Trade-off between robustness and future performance (postponement of investments).
- Agricultural income instead of household income is considered.
  - → Off-farm income sources are becoming increasingly important (in Germany) and will undoubtedly have an impact on farm robustness and overall resilience.
- Focus on the economic robustness of farms.
  - → Resilience comprises also the capacity of adaptability and transformability.

Thank you and stay robust! ☺

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