Resilience Capacities of Ukrainian Farms to War-Induced Shocks

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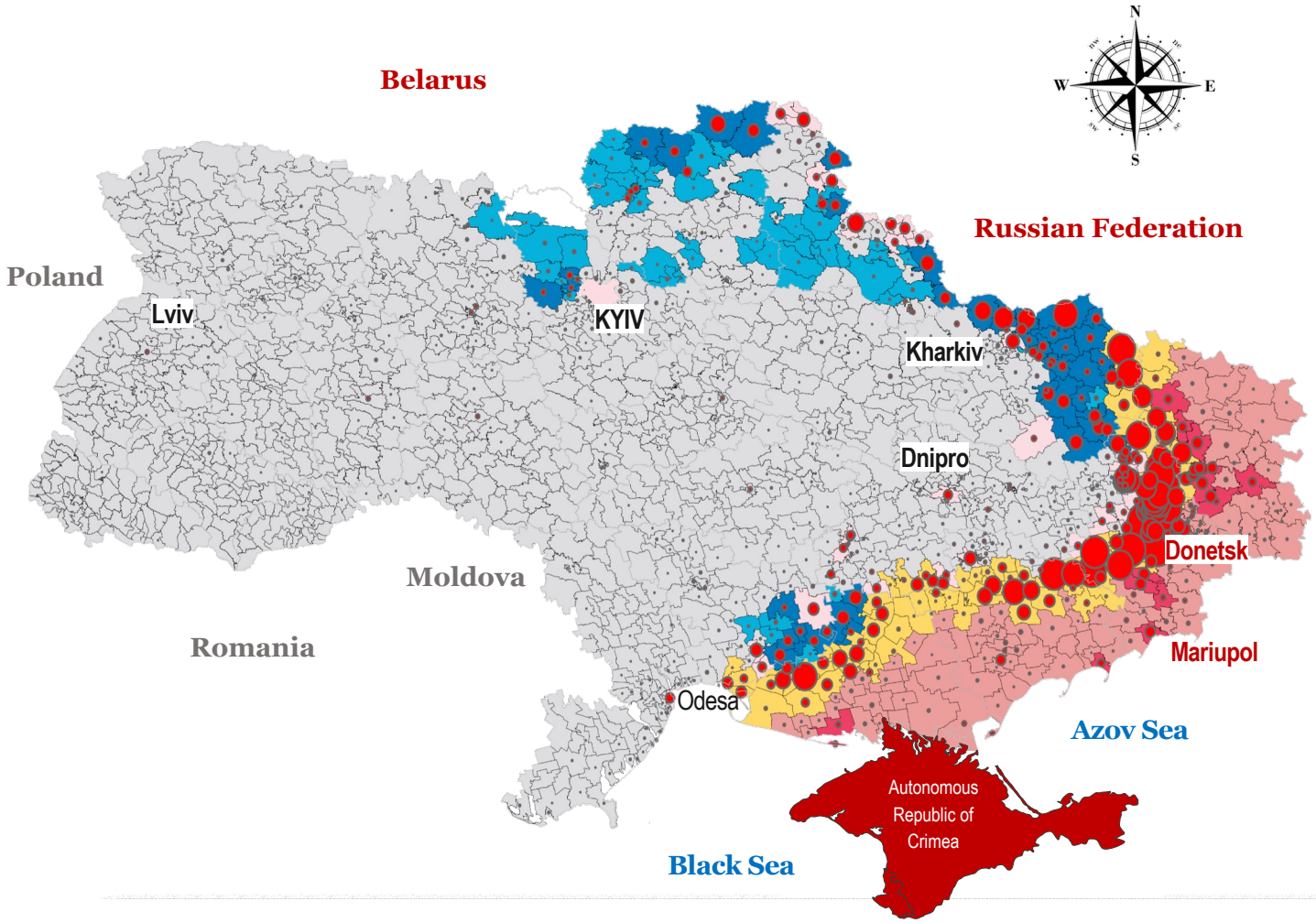
WAR-INDUCED SHOCKS FROM RUSSIA'S INVASION

Community (hrodama) warfare status and shelling intensity



r_1 – Occupied, high level of attacks

r_2 – Occupied, low level of attacks

r_3 – Liberated, high level of attacks

r_4 – Liberated, low level of attacks

r_5 – Frontline

r_6 – Not exposed, high level of attacks

r_7 – Not exposed, low level of attacks

Occupied territories excluded from the analysis

Territories with no population (Chornobyl Exclusion zone)

Number of Strikes per hromada

1,000 2,000 3,000 4,000

Source: Authors. Note: The data for the Autonomous Republic of Crimea and Chornobyl Exclusion Zone is not available

TYPES OF WAR-INDUCED SHOCKS

Source: Authors.

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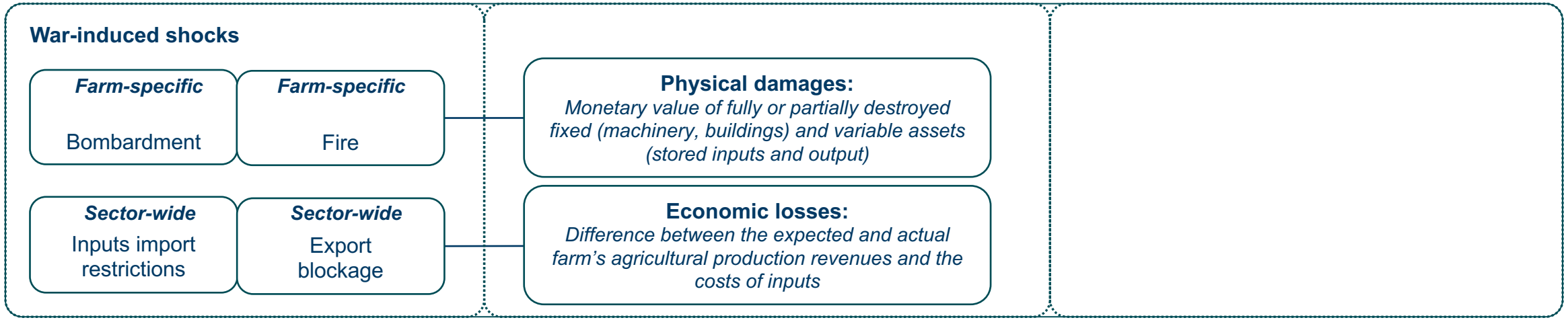


Source: Authors.

TYPES OF WAR-INDUCED SHOCKS

War-induced shocks

Farm-specific Bombardment	***Farm-specific*** Fire
Sector-wide Inputs import restrictions	***Sector-wide*** Export blockage

Physical damages:
Monetary value of fully or partially destroyed fixed (machinery, buildings) and variable assets (stored inputs and output)

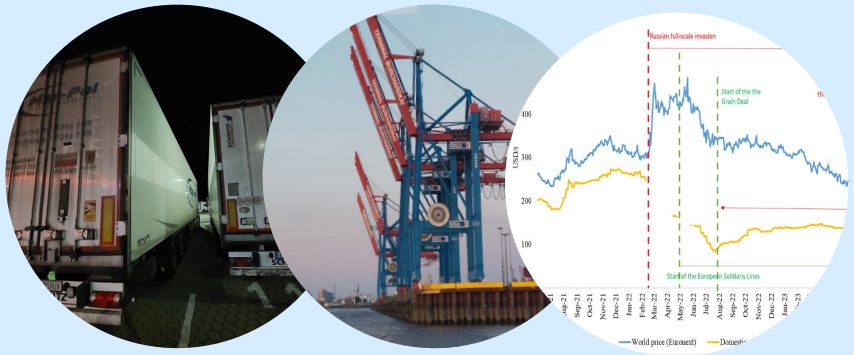
Economic losses:
Difference between the expected and actual farm's agricultural production revenues and the costs of inputs

Impacts → **Farm operations**
Operations are constrained by reduced availability of production factors, restricted access to inputs and outputs markets, and challenged profitability

Source: Authors.

Idiosyncratic (farm-specific) shocks causes mostly physical damages of farms

Covariate (sector-wide) shocks mostly causes economic lossess of farms



Picture sources: Donetsk regional military administration, Odesa regional military administration, Rico Ihle, Countryman et al. (2024)

RESILIENCE CAPACITIES OF UKRAINIAN FARMS

ROBUSTNESS
Farm tolerates as much shock as it can until it forced to change the production processes or production focus

ADAPTABILITY
Farmer modifies existing production processes in response to shock

TRANSFORMABILITY
Farmer implements new production processes and/or change in production focus which require investments in new assets, human capital and time

While facing losses and/or damages, farmer does not alter inputs, capital and labor use or production portfolio

e.g., farmer is ready to tolerate 20% of earnings drop, 15% of fuel price increase and damage to 20% of crops in field

Farmers alters machinery, labor, inputs usage

e.g., to switch between export and domestic markets, switch from cashless to cash operations, focuse on growing oilseeds instead of leguminous

Farmers invest time and resources in new equipment, technology and knowledge

e.g., to start growing new crops, rearing new livestock or switch from conventional to organic farming

MEASUREMENT OF TRANSFORMABILITY

1. Identify the production aspects affected by war

Impacts are observed in two dimensions: sectoral effects on costs, prices, and capital, and farm-level effects on production factors

Affected at sectoral level:

- Production costs (increase)
- Farm-gate (output) prices (decrease)
- Working capital (decrease)
- Availablity of employees (decrease)
- Fertilizers/feed price (increase)
- Fuel price (increase)
- Farm earnings (decrease)

Affected at farm level:

Decrease in physical availability of on-farm:

- Land
- Livestock
- Crops
- Inputs (seeds, feed, fertilizers, PPPs)
- Buildings
- Machineries

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2. Identify and quantity the thresholds

Subjectively defined benchmark level of shock that can be tolerated i.e., robustness

Threshold measurement:
Farm is able to tolerate shocks at sectoral level:
- xx% increase of production costs
- xx% decrease of farm-gate prices
- xx% decrease of working capital
- xx% decrease of employee availability
- xx% increase of fertilizer/feed prices
- xx% increase of fuel price
- xx% decrease of farm earnings

and at farm level:
- xx% decrease of land availability
- xx% decrease of livestock herd
- xx% decrease of crop availability
- xx% decrease of input availability (seeds, feed, fertilizers, PPPs)
- xx% decrease of usable buildings
- xx% decrease of machinery availability

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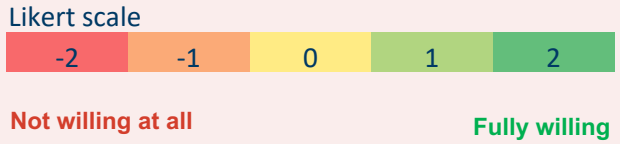
3. Measure the subjective willingness to transform if shock surpasses threshold

e.g., if working capital decreases by more than xx%, how willing is the farmer to transform the production to stay operational



RESULTS OF TRANSFORMATIVE CAPACITY ANALYSIS

R1 Occupied high

Shock	Score
Not feasible to collect	N/A

R2 Occupied low

Shock	Score
Not feasible to collect	N/A

R3 Liberated high

Shock	Score
Lower working capital	0,25
Higher production costs	-0,06
Less availability of crops	-1,00
Less availability of buildings	-1,13

R4 Liberated low

Shock	Score
Lower working capital	0,13
Less avail. of machineries	0,07
Less earnings	-0,67
Less availability of livestock	-1,35

R5 (Frontline)

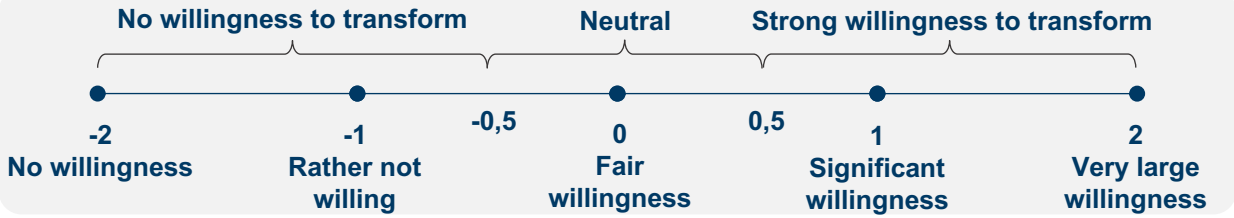
Shock	Score
Higher production costs	1,57
Less employees	1,39
Less availability of inputs	0,22
Less availability of livestock	-0,39

R6 Not Exposed high

Shock	Score
Less avail. of machineries	0
Less employees	-0,31
Less availability of livestock	-1,46
Less availability of crops	-1,54

R7 Not Exposed low

Shock	Score
Less avail. of machineries	0,23
Lower working capital	0,17
Higher fuel prices	-0,77
Less availability of livestock	-1,38



Small crop farms

Shock	Score
Less avail. of machineries	0,21
Higher production costs	0,07
Less avail. of usable land	-0,81
Higher fuel prices	-0,85

Big crop farms

Shock	Score
Lower working capital	0,38
Less avail. of machineries	0,22
Less earnings	-0,61
Less avail. of usable land	-0,63

Small livestock farms

Shock	Score
Higher production costs	0,60
Higher price fertilizers, feed	0,60
Higher fuel prices	-0,88
Less earnings	-1,05

Big livestock farms

Shock	Score
Higher production costs	1,57
Higher price fertilizers, feed	1,43
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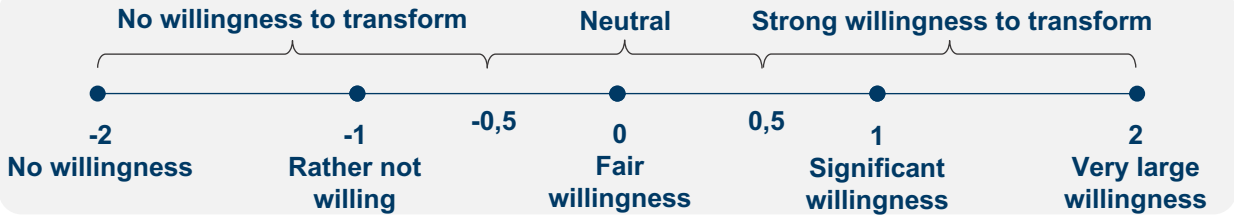

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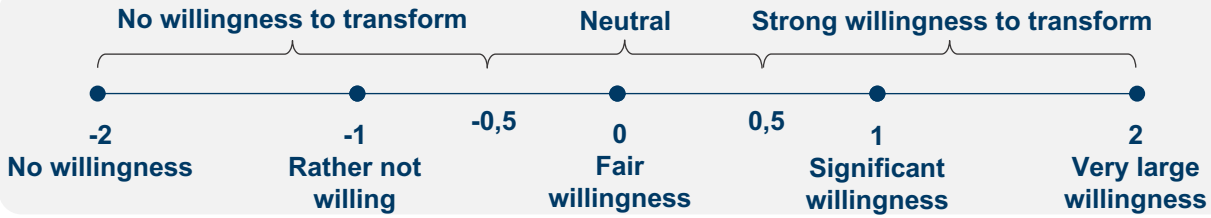

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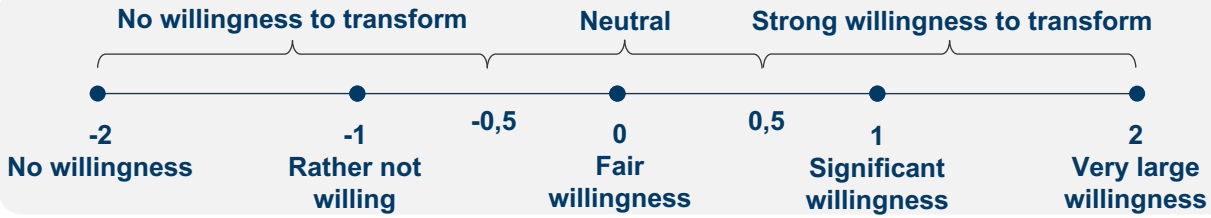

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SUMMARY

- **Impact of warfare is not uniformly distributed, but depends on shelling intensity & territorial control**
- **Shocks impact farm operations via direct damages & sector-wide losses**
- **Farms possess three resilience capacities: withstand, adapt, transform**
- **Transformability = readiness to significantly change production (invest in new products, technologies and knowledge) beyond tolerable shock level**

- **Drivers of transformability differ by exposure intensity & farm type:**
  - Not exposed and liberated areas: low willingness to transform & driven by mainly idiosyncratic damages
  - Front-line areas: highest willingness to transform driven by mainly economic losses
  - Crop farms: low transformative capacity
  - Large livestock farms: high transformative capacity presumably due to high production costs
- **Reasons not to transform also differ by exposure intensity & farm type:**
  - Across all zones: idiosyncratic shocks are strong reasons not to transform operations (except frontline where transformability is generally more preferred in comparison to other zones)
  - Land damage is a weak reason to transform for crop farms (while large farms reveal higher willingness)
  - Less earnings for small livestock farms is a strong reason not to transform