

# Determinants of productivity & structural change in a large farm environment: Evidence from Ukraine

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ERS workshop, Feb. 2, 2017

# Motivation

- **Farm size productivity relationship**
  - Long-held tenet in agric. economics (and quite robust)
  - But most studies from land-scarce settings with low mechanization
  - Household surveys may be truncated
  - Small farm sizes in Europe may be policy related
  - Should there be a focus on large farms instead?
  - Especially with innovations in genetics and IT
  - May also be due to factor market imperfections local monopoly
- **Implications for broader development & agrarian structure**
  - Political economy dimensions
  - Employment generation: Long-run development
- **Ukraine as one example**
  - Relatively large farms, enormous structural change since 2000
  - Significant productivity increases, little protection
  - Good production data

# Ukraine: Farm size structure in 2014

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Sizegrp (ha)	Farms		Land	
	Total no.	Share (%)	Tot. area (ha)	Share (%)
0.1-10	4,257	12.7	21,597	0.1
10.1-50	9,395	28.0	294,021	1.4
50.1-200	8,127	24.2	830,779	4.0
200.1-1,000	6,419	19.1	3,106,804	14.8
1,000-5,000	4,660	13.9	10,175,603	48.5
above 5,000	683	2.0	6,532,444	31.2
Total	33,541	100	20,961,247	

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# Data

- **Annual large farm/enterprise census (>200 ha)**
  - Universe of about 10,000 enterprises/legal entities
  - Mail survey, often linked w accounting software (transfer price)
  - Data on input and output values (weak qs for capital)
  - An enterprise may operate several production units
- **Other surveys & administrative data**
  - Small farms: Annual sample; full census every 4 years (4/8/12)
  - Annual production units (at rayon level): Linking an issue
  - Admin. data on # & length of leases; staffing, taxes, etc. 13/14
- **Questions to be addressed**
  - Do we see economies of scale?
  - Impact of transaction cost of lease registration -> pilot
  - Extent of factor market imperfections
  - Direction & determinants of investment & structural change

# Significant structural change

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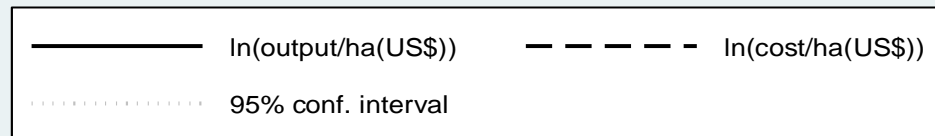
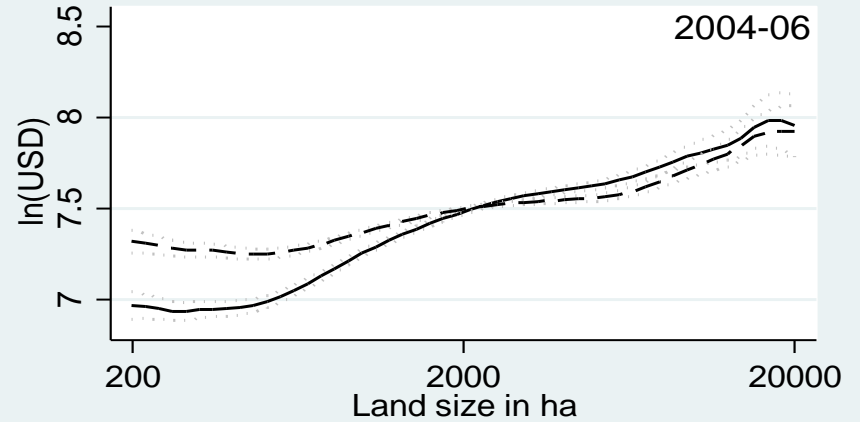
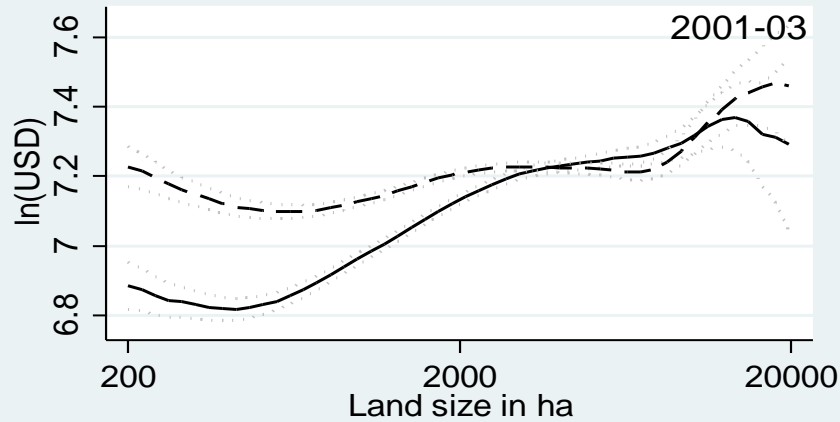
	<b>Yield (kg/ha) 2004-12</b>	
Wheat	2950	2680
Corn	3305	4257
Barley	1830	2043
Soybean	1081	1598
Sunflower	942	1864
Sugarbeet	19746	39068

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	<b>Output share: 2001-12</b>	
Grains	0.803	0.542
Wheat	0.414	0.219
Corn	0.028	0.157
Barley	0.152	0.092
Sunflower	0.065	0.413
Root crops	0.106	0.031

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# Profitability increased over time



# ... with significant land concentration

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	<b>Entire sample 2004-12</b>	
Area cultivated (mn ha.)	20.59	17.87
Avg. farm size (ha)	2,061	2,320
Median farm size (ha)	1,625	1,422
Area under farms > 10,000 ha	654,755	3,633,922
Area under farms > 20,000 ha	255,572	2,200,557
No. of farms > 10,000 ha	40	163
Maximum farm size (ha)	88,032	154,148
Profit/ha	8.13	43.99
Output /ha	172.31	547.71
Cost/ha	164.18	503.72
	<b>Single unit</b>	
Area cultivated (mn ha.)	15.80	12.42
Avg. farm size (ha)	1895	1833

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# Emergence of multi-branch production units

	2004			2012		
	Single	Multi	Diff. %.	Single	Multi	Diff. %
<b>Farm characteristics</b>						
Farm size (ha)	1,936	4,218	117.87	1,872	5,666	202.67
Size of opr'l unit (ha)	1,936	1,961	1.29	1,872	2,051	9.56
Profit/ha (US\$/ha)	16	54	237.50	40	76	90.00
Output/ha (US\$/ha)	218	376	72.48	529	686	29.68
Cost/ha (US\$/ha)	202	322	59.41	490	610	24.49
<b>Yields (kg/ha)</b>						
Wheat	2,918	3,752	28.58	2,638	2,973	12.70
Corn	3,258	4,144	27.19	4,169	4,781	14.68
Barley	1,812	2,258	24.61	2,005	2,316	15.51
Soy	1,063	1,255	18.06	1,579	1,692	7.16
Rape	1,553	1,730	11.40	1,948	2,069	6.21
Sunflower	933	1,123	20.36	1,843	2,015	9.33
Sugar beet	19,375	28,018	44.61	38,097	42,710	12.11
No. obs.	8,339	322		6,799	912	



# Production function

	All farms 2001-12				Single units 01-12	
Land (ha)	0.184*** (13.186)	0.240*** (20.474)	0.341*** (30.509)	0.278*** (28.929)	0.334*** (23.873)	0.286*** (21.331)
Labor	0.149*** (17.860)	0.129*** (22.113)	0.133*** (24.306)	0.155*** (47.452)	0.117*** (17.711)	0.134*** (32.963)
Seed	0.156*** (14.768)	0.162*** (19.871)	0.142*** (23.582)	0.139*** (34.254)	0.149*** (20.583)	0.141*** (25.914)
Fertilizer	0.132*** (30.022)	0.135*** (37.208)	0.090*** (31.220)	0.101*** (53.544)	0.096*** (27.106)	0.109*** (42.655)
Machinery	0.096*** (21.920)	0.076*** (21.393)	0.068*** (21.200)	0.075*** (37.884)	0.069*** (17.801)	0.080*** (31.638)
Fuel & energy	0.275*** (26.511)	0.214*** (28.993)	0.160*** (25.308)	0.180*** (41.519)	0.147*** (18.121)	0.168*** (34.706)
Other	0.104*** (26.141)	0.085*** (28.629)	0.073*** (30.858)	0.085*** (53.819)	0.085*** (26.289)	0.099*** (45.990)
Fixed eff. /IV	No	Rayon	Farm	OP	Farm	OP
Observations	100,600	100,600	100,600	64,513	64,513	64,513
F-test for CRS	211.2	80.89	0.958	2.12	0.0601	1.80
Sum of coeff's	1.096	1.041	1.008	1.01	0.997	1.02

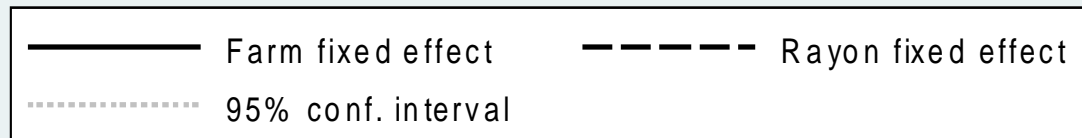
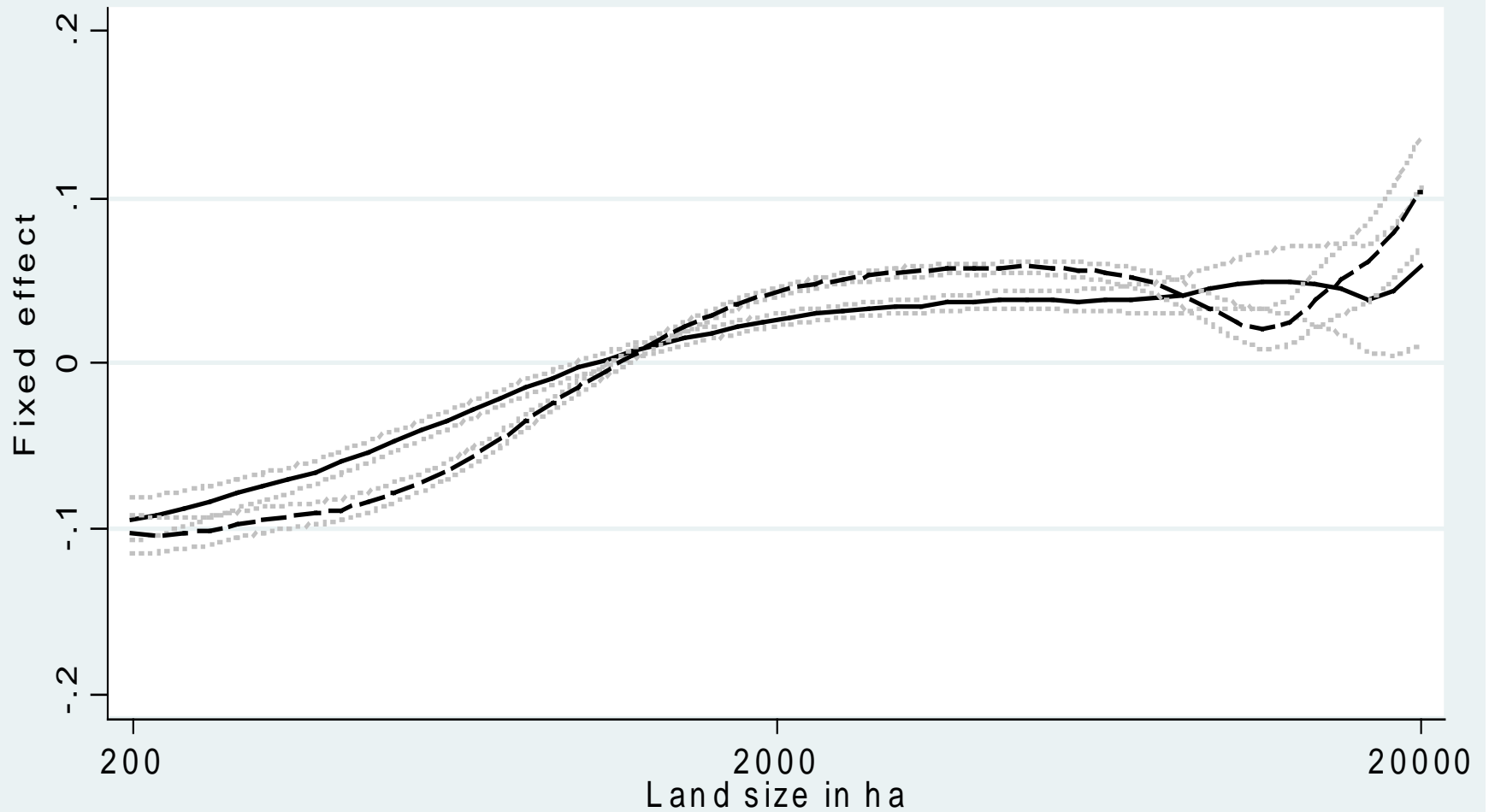
# Factor market performance

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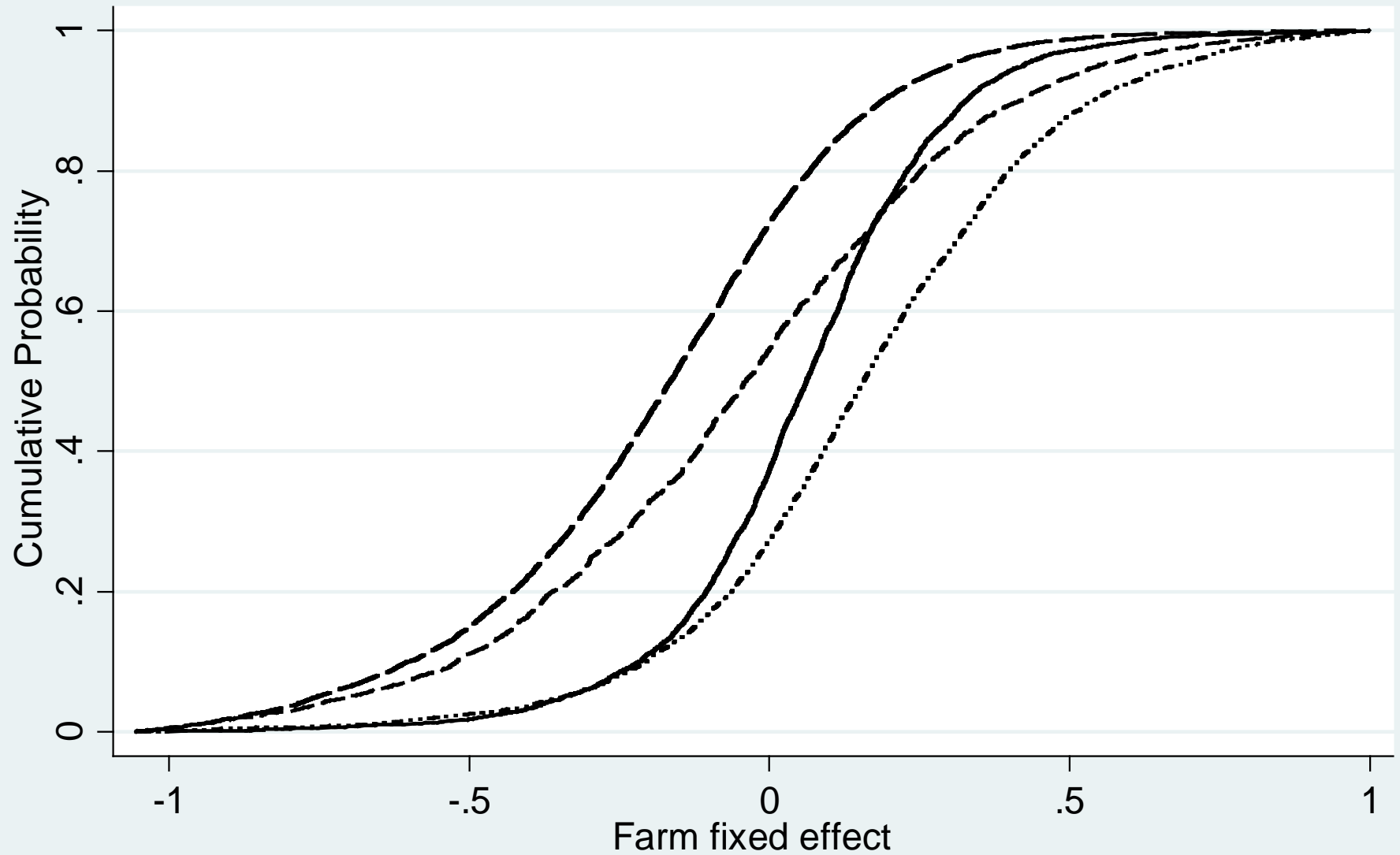
Period	Land		Labor		Fertilizer	
	Elast.	C. share	Elast.	C. share	Elast.	C. share
2001-04	0.383	0.309	0.160	0.214	0.076	0.125
2005-08	0.270	0.209	0.148	0.208	0.086	0.155
2009-12	0.304	0.202	0.089	0.132	0.107	0.161
<b>2001-12</b>	<b>0.319</b>	<b>0.240</b>	<b>0.132</b>	<b>0.185</b>	<b>0.090</b>	<b>0.147</b>

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# Rayon- & farm fixed effects



# Farm fixed effect by nature of entry/exit



# Determinants of entry & exit

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	<b>% area exiting</b>	<b>% area entering</b>
Init. share >5000 ha	-0.557*** (-2.638)	-0.271 (-1.609)
Initial productivity	-1.684*** (-5.537)	-0.651*** (-2.683)
Init. share>5000 ha*py.	-1.074* (-1.876)	-0.358 (-0.782)
Rayon fixed effect	0.638*** (4.464)	1.237*** (10.833)
Observations	463	463
R-squared	0.190	0.318

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# Implications

- **Farm size-productivity**
  - Market for managers are unobserved
  - Farms grow if they have good managers – not reverse!
  - Public goods still to be provided
  - Decomposing farm- and rayon level fixed effects
- **Transition and agrarian structure**
  - Impact of initial structure on evolution
  - Extent and sources of market power to be explored
  - May be linked to state land leasing (no data)
- **Role of small farms/structural change in long term?**
  - Access to financial markets key
  - Current reform proposals