Extended Abstract
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Paper/Poster Title	Localized Urbanization and Agricultural Industrialization at the Micro-Scale

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Abstract	*200 words max*

This research seeks to quantify the effects of localized urbanization on the size and spatial distribution of beef cattle herds in Great Britain. We combine monthly geocoded data on herd-level animal holdings and entry and exit patterns for all herds with spatiotemporal price-paid data for nearby home sales (as a proxy for local urban pressure) between 2010-2018. We find that localized urbanization generates heterogeneous impacts on nearby cattle farms. Increasing home prices cause smaller herds in neighbouring areas to downsize or exit the industry, whereas large farms scale up in the face of growing urban pressures. Based on these relationships, we simulate changes in the structure of the British cattle industry over the next decade.

Keywords	Urbanization, Agricultural Industrialization, Structural Change, Great Britain, Cattle Industry
JEL Code	Q12, R12 see: www.aeaweb.org/jel/guide/jel.php?class=Q)

Introduction	*100 – 250 words*

Approximately 55% of the global population lived in urban areas in 2018. This number is expected to increase to 68% by 2050. A large body of literature has investigated the macro-level effects of urbanization on the food system, through rising incomes, changing diets, and more complex retail food markets. However, there has been less attention paid to the micro-scale relationship between localized urbanization and the structure of the proximate farming sector. Here, we seek to quantify the effects of local urban pressures on the size and spatial distribution of farms in the context of beef cattle farming in Great Britain. We construct a dataset that combines monthly geocoded data on herd-level animal holdings and entry and exit patterns for all British beef herds with spatiotemporal price-paid data for nearby home sales (as a proxy for local urban pressure) between 2010-2018. Our final dataset includes monthly observations for 68,113 beef herds from January 2010 to December 2018 with a total of 7.4 million observations.

Methodology	*100 – 250 words*

We estimate a series of econometric models designed to assess the impacts of localized urbanization (proxied by price-paid for local home sales) on (1) survival of nearby cattle farms and (2) the size of cattle farm operations (evaluated in terms of animal holdings). These models are constructed as follows:

(1) **Impacts of Localized Urbanization on Herd Size:** We estimate the following econometric model to test the impact of current house prices on herds' sizes (analysis A):

$$y_{it} = \alpha + \beta_0 H_{Y,S_i} + \lambda_0 P_{it} + \left(\sum_Q \alpha_Q \iota_{Q,i} + \beta_Q \iota_{Q,i} H_{Y,S_i} + \lambda_Q \iota_{Q,i} P_{it} \right) + \gamma_i + \delta_t + \varepsilon_{it}$$

where variable y_{it} is the natural logarithm of the number of animals in herd i observed at time t. Variable H_{Y,S_i} is the natural logarithm of annual average house price of square S_i—the 1km-by-1km grid square corresponding to the location of herd i. Variable P_{it} is the contemporaneous beef price, which differs for England and Wales. The terms in the parentheses allow responses to urbanization (variable H_{Y,S_i}) beef price changes (variable P_{it}) to differ based on the size of the herd. To allow for this, we interact these variables with seven "size" categories indexed by subscript $Q \in (1,2,...,7)$. Variables γ_i and δ_t, respectively, are the herd-specific and time-specific fixed effects.

(2) **Impacts of Localized Urbanization on Farm Survival:** To estimate the effects of localized urbanization on neighbouring farms' exit from farming, we re-estimate the model described above, except that the dependent y_{it} is defined as a dummy variable to indicate whether herd i continues to operate at time t.

Results	100 – 250 words

By estimating the models described above, we find that localized urbanization generates heterogeneous impacts on nearby cattle farms, both with respect that a farm will exit the industry or that the farm will choose to downsize or expand.

(1) **Impacts of Localized Urbanization on Herd Size:** We find increasing home prices cause smaller herds in neighbouring areas to downsize. For the smallest 50% of herds in any given period, a 10% increase in local housing prices is associated with a ~0.3% reduction in herd size. In contrast, growing urban pressures cause large farms to scale up. Similarly, for the top 10% of herds in a given period, a 10% increase in home prices is associated with a 0.82% increase in herd size.

(2) **Impacts of Localized Urbanization on Farm Survival:** Small herds are also more likely to exit the market in the face increasing urban pressure. For the smallest 50% of herds, a 10% increase in local housing prices increases the probability a given herd will exit by 0.29%. In contrast, for the top 10% of herds, an equivalent increase in home prices reduces the probability a herd will exit by 0.33%.

Discussion and Conclusion	100 – 250 words

Based on the relationships we estimate above and the trajectory of localized urbanization in Great Britain, we simulate changes in the structure of the British cattle industry over the next decade. This exercise suggests that—as a result of local urban pressures—the number of small cattle farms will fall by more than 15% over the next decade and average size of a British cattle farm will increase by 12%. Our findings regarding the micro-scale linkage between urbanization and livestock farming lends insights into a number of fundamental questions regarding the sustainability of food

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systems, including, the urban-rural relationship, food security, and the environmental impact of farming.