Poultry

Econ 235

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Introduction

- The United States is the largest producer of poultry and the second largest exporter of poultry.
- The 2012 Census of Agriculture reports that there are 233,770 poultry farms in the United States;
- The U.S. poultry industry produced in 2014:
  - 8.54 billion broilers;
  - 99.8 billion eggs;
  - 238 million turkeys.
- Sales of chickens were worth $48.3 billion in 2014.
- The poultry industry is very much vertically integrated.
- Production cycles in hogs are very short in the poultry industry but are essentially eliminated.

Introduction

- I will focus on the poultry and the egg industries.
- I will begin with definitions, review some market data and finally turn to the economics of the poultry industry.

Resources

- Fact Sheet about the US poultry industry.
- Egg Industry Center at Iowa State University.
- Poultry & eggs from the Economic Research Service at the USDA.

Definitions

- Poultry: Domestic fowl, includes chicken and turkey.
- Chicken: A domestic fowl.
- Turkey: A domestic fowl, bigger than a chicken.
- Hen: A female chicken or turkey.
- Rooster: A male chicken.
- Gobbler: A male turkey.
- Pullet: A young hen.
- Chick: A young chicken.
- Broiler: Chicken raised for meat production.
- Table eggs: Eggs grown for sale to consumers.
- Breaker eggs: Eggs grown for breaking, sold in liquid form and used in the food industry. They can be sold liquid, dried or frozen.

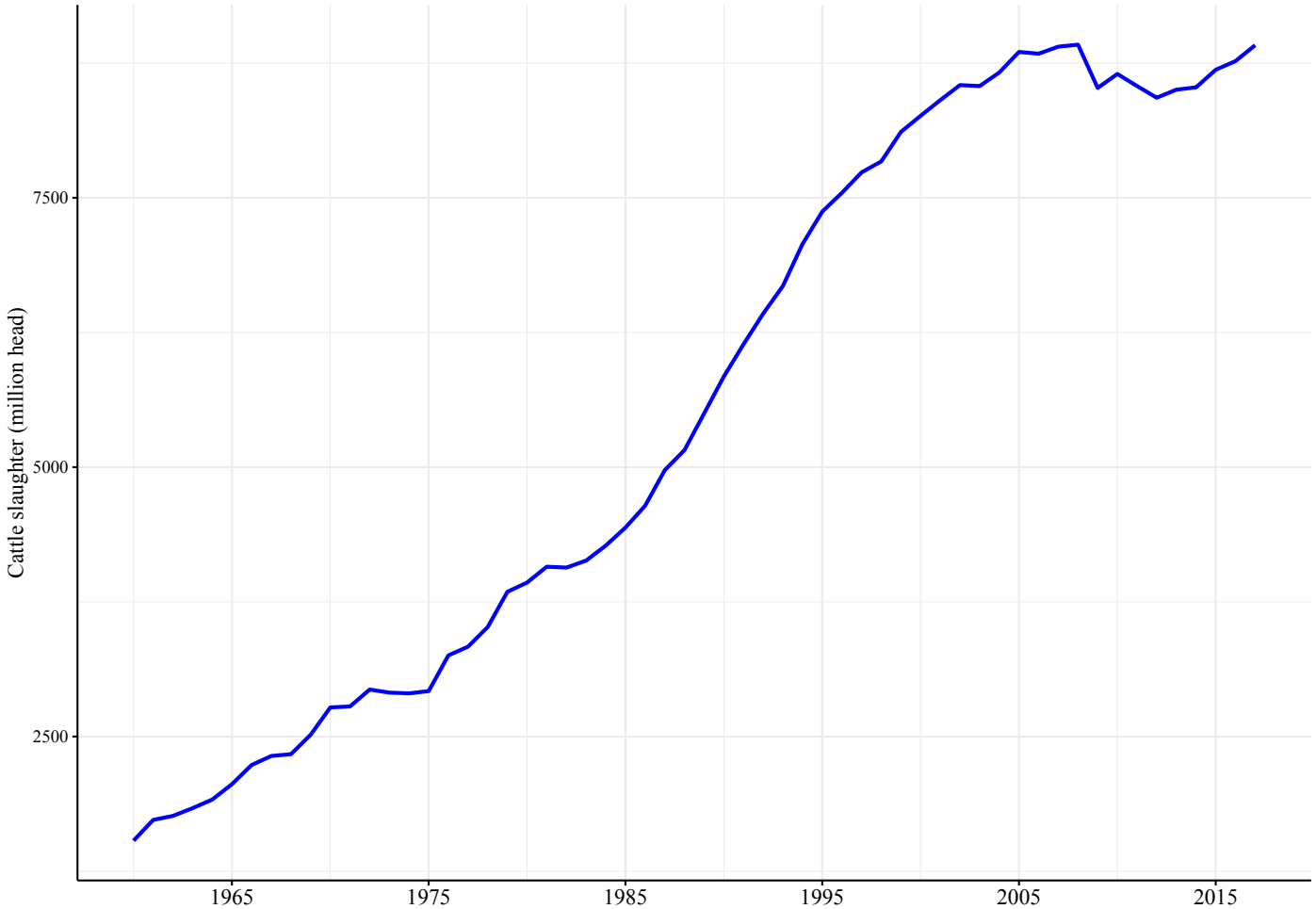
Supply chain

- Poultry industry:
  - Primary breefer farms: Produce fertilized eggs that are hatched to become breeders.
  - Breeder farms: Raise hens and roosters to producer fertilized eggs.
  - Hatcheries: hatch fertilized eggs into chicks.
  - Chicken farms: Grown chicks into broilers.
  - Poultry processing plant: Take live bird and turn them into meat.

Supply chain

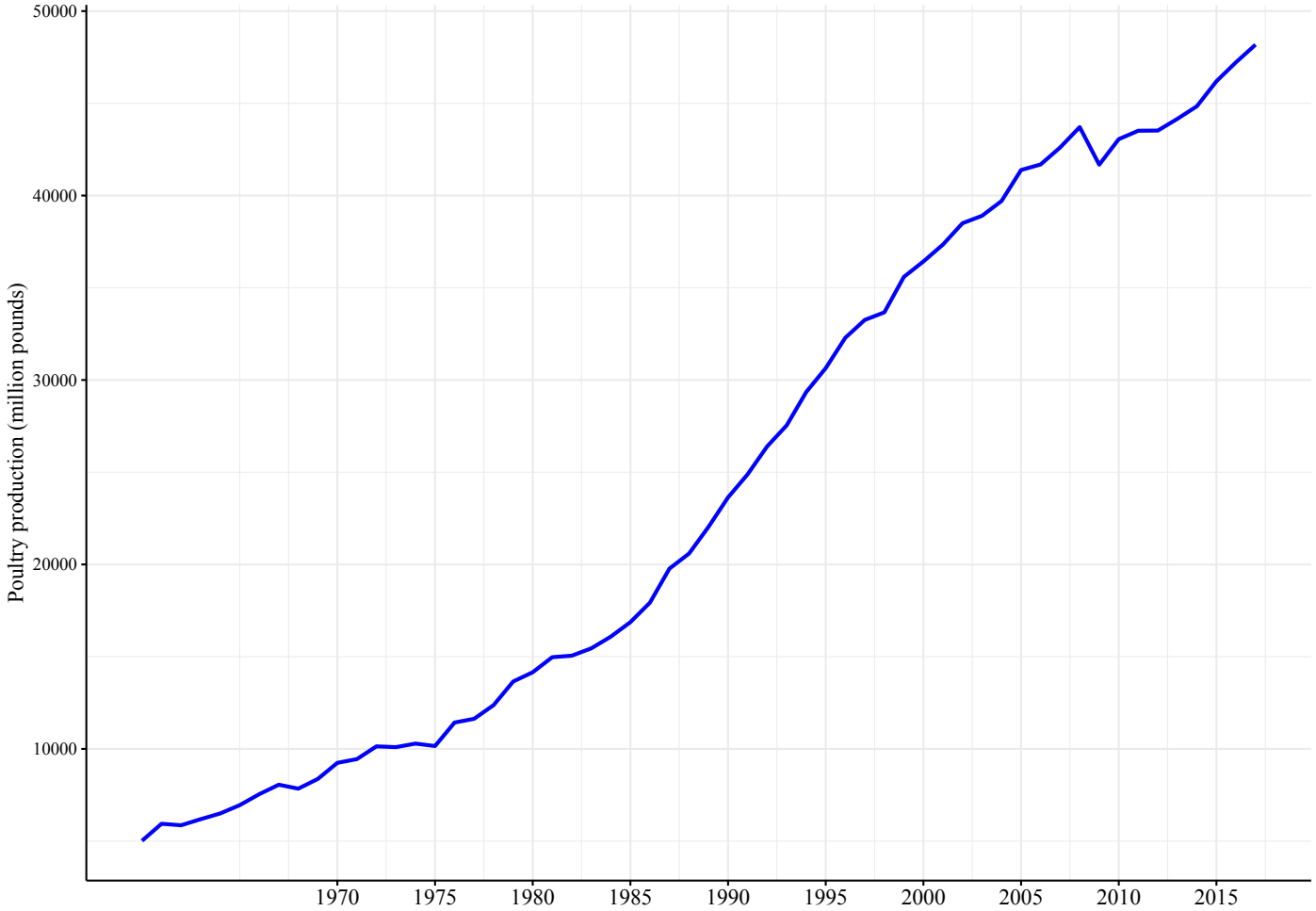
- Egg industry:
  - Breeder farms raise hens and roosters to producer fertilized eggs.
  - Hatcheries: Hatch the eggs and select the hens.
  - Egg farms: Harvest eggs from egg-laying hens.

Annual commercial broiler chicken slaughter



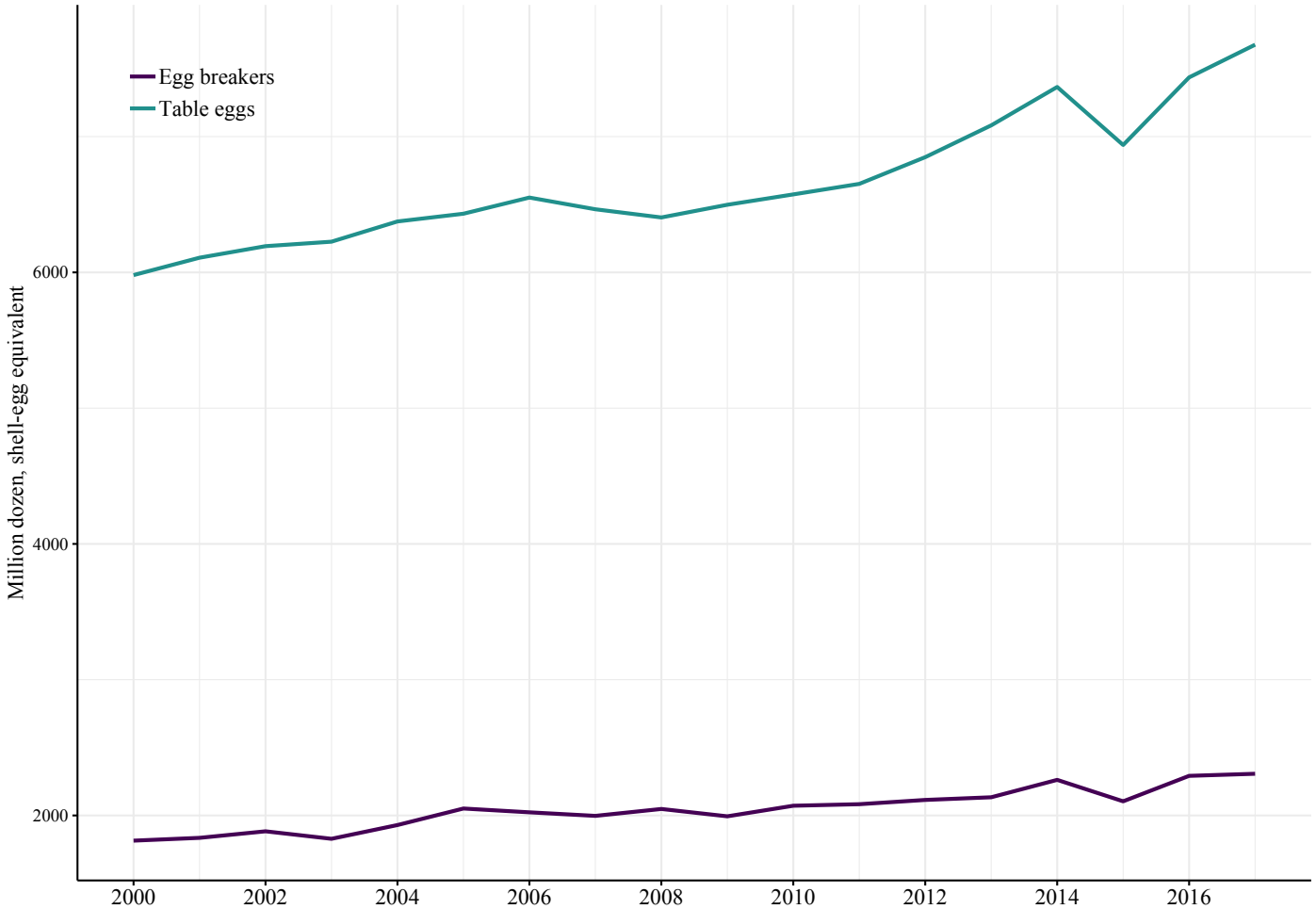
Source: USDA - Economic Research Service (2018b).

Annual poultry production



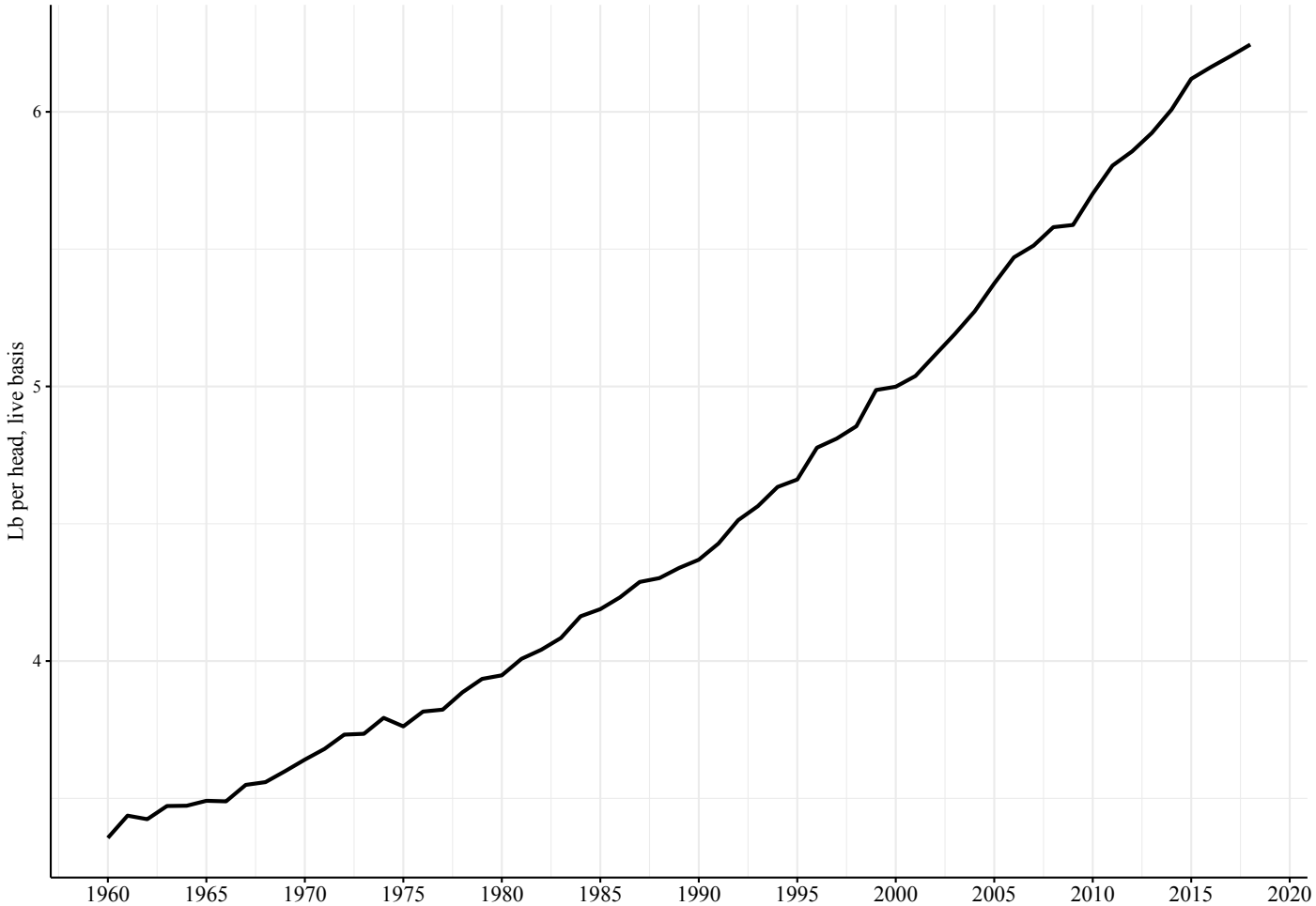
Source: USDA - Economic Research Service (2018b).

Table eggs and egg breakers annual production



Source: USDA - Economic Research Service (2018b).

Broilers weight (live basis)



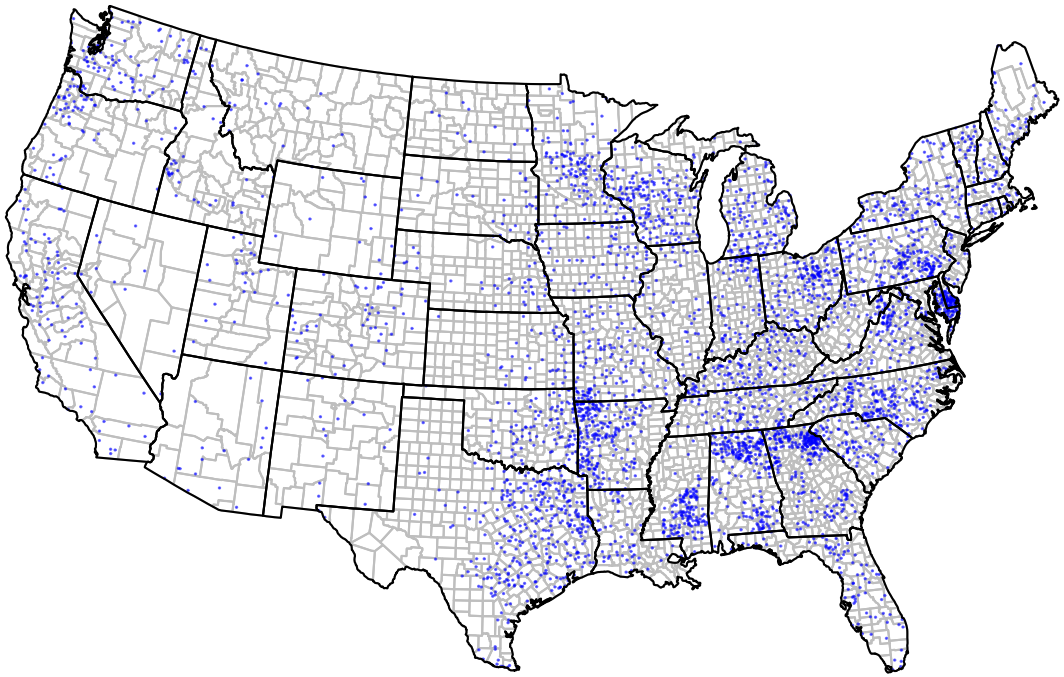
Source: USDA - Economic Research Service (2018b).

Chicken broiler production by state (2017)

State	Value
Alabama	1095.4
Arkansas	1059.0
Georgia	1363.4
Mississippi	741.1
Other states	4654.1
Note:	
Million heads	

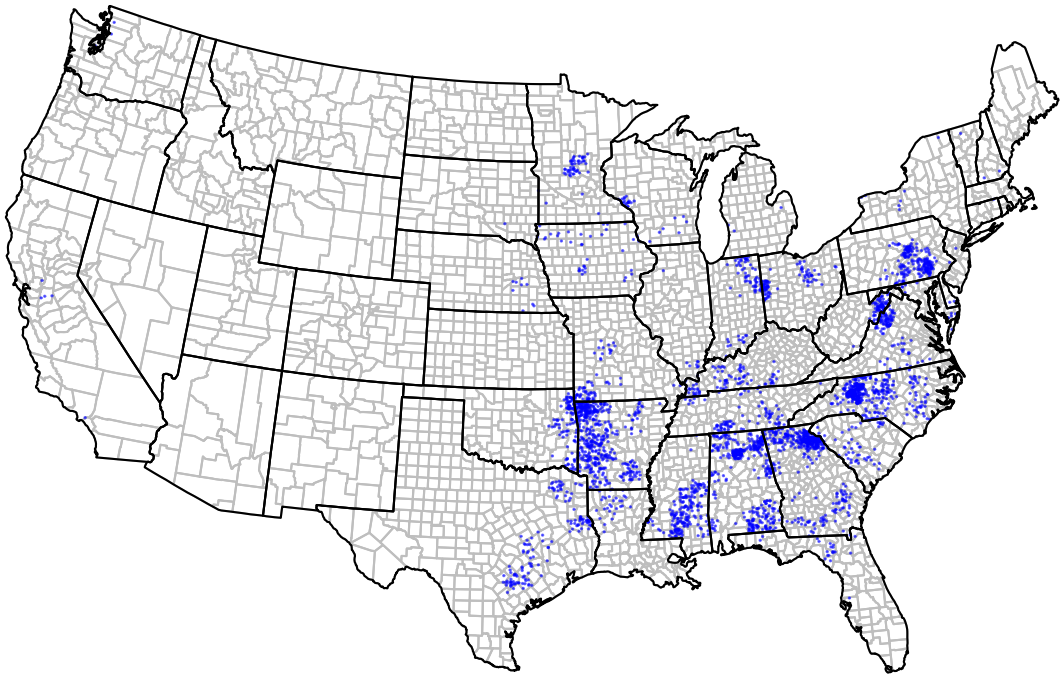
Source: USDA - National Agricultural Statistics Service (2018).

Operation with broilers inventory by county (2012 census of agriculture)



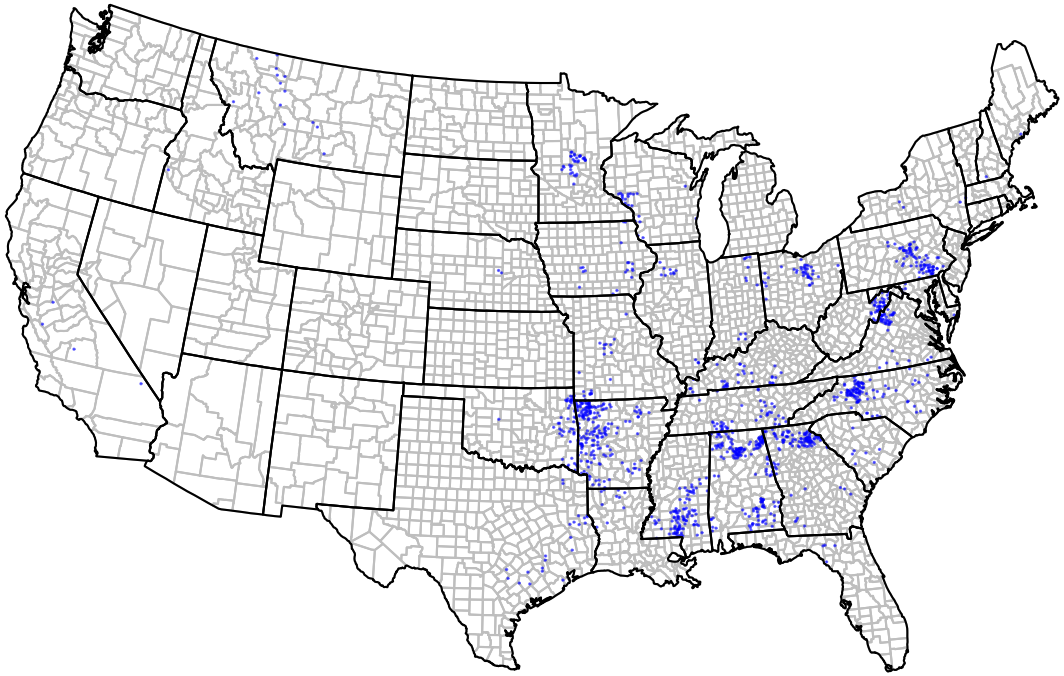
This is a density dot map where each dot represents about 10 operations, randomly located within a county. Data source: USDA - National Agricultural Statistics Service (2018).

Egg farms with production contracts (2012 census of agriculture)



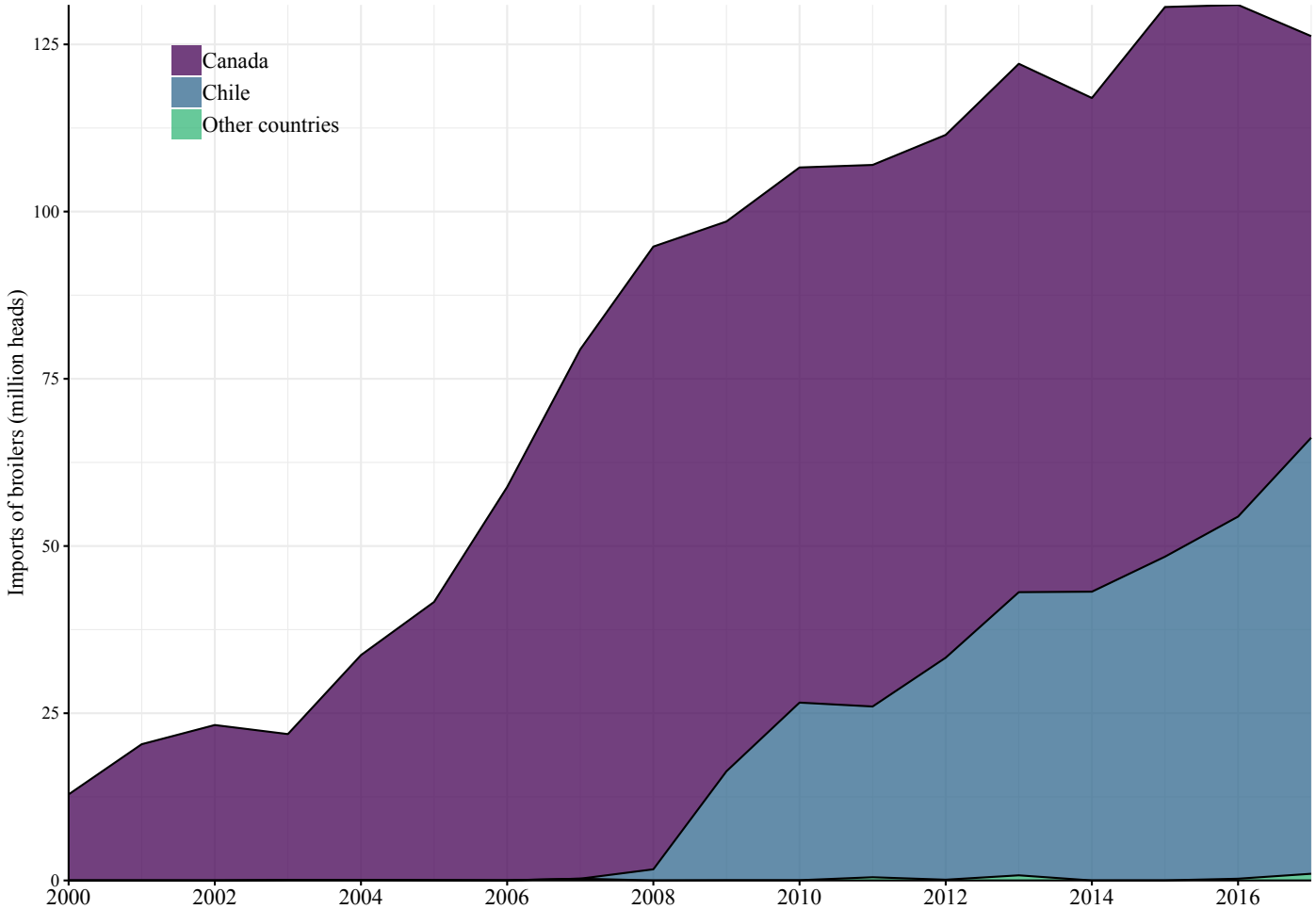
This is a density dot map where each dot represents about 1 operation, randomly located within a county. Data source: USDA - National Agricultural Statistics Service (2018).

Farms with more than 10,000 layers (2012 census of agriculture)



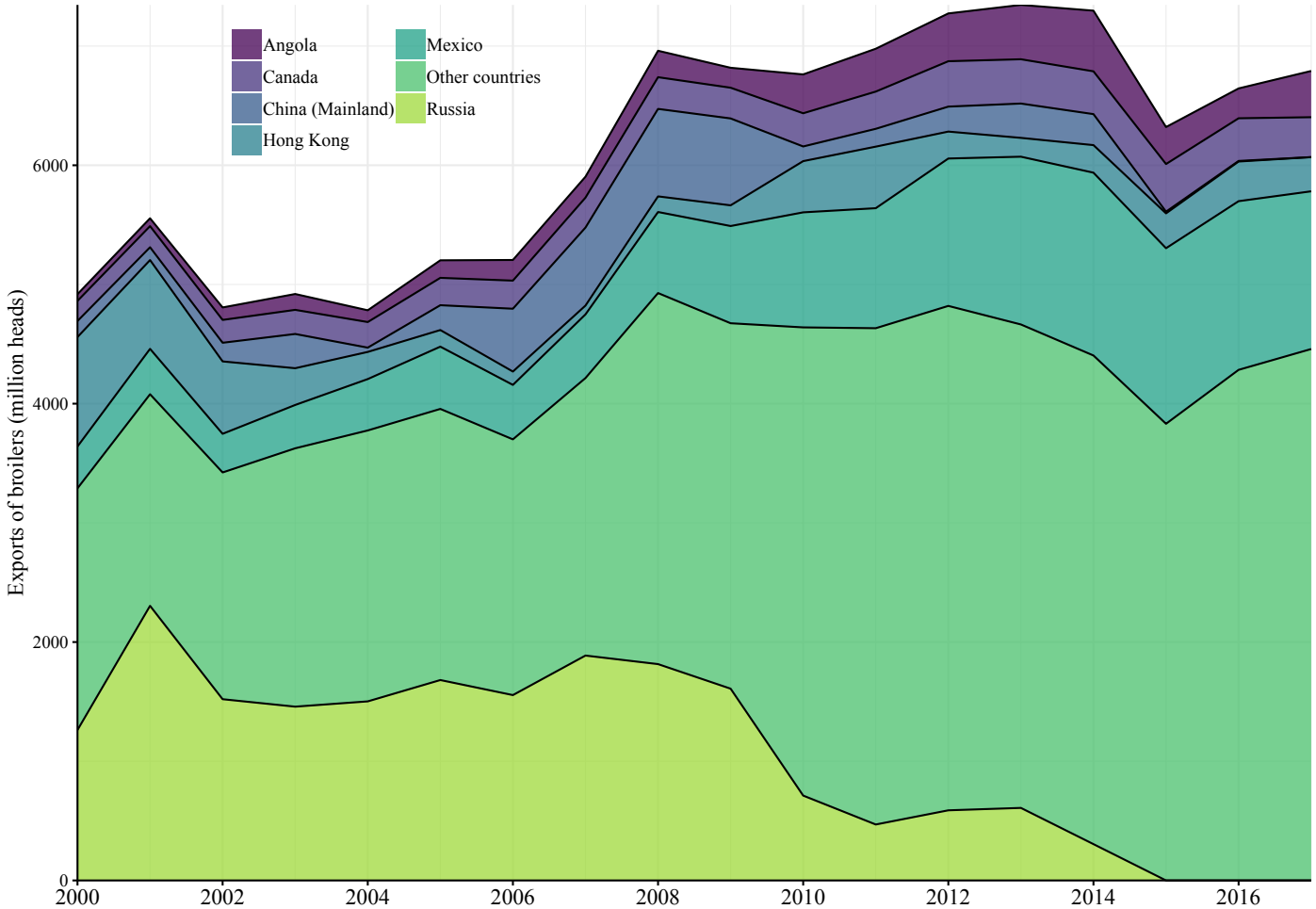
This is a density dot map where each dot represents about 1 operation, randomly located within a county. Data source: USDA - National

Annual broiler imports



Data source: USDA - Economic Research Service (2018c).

Annual broiler imports

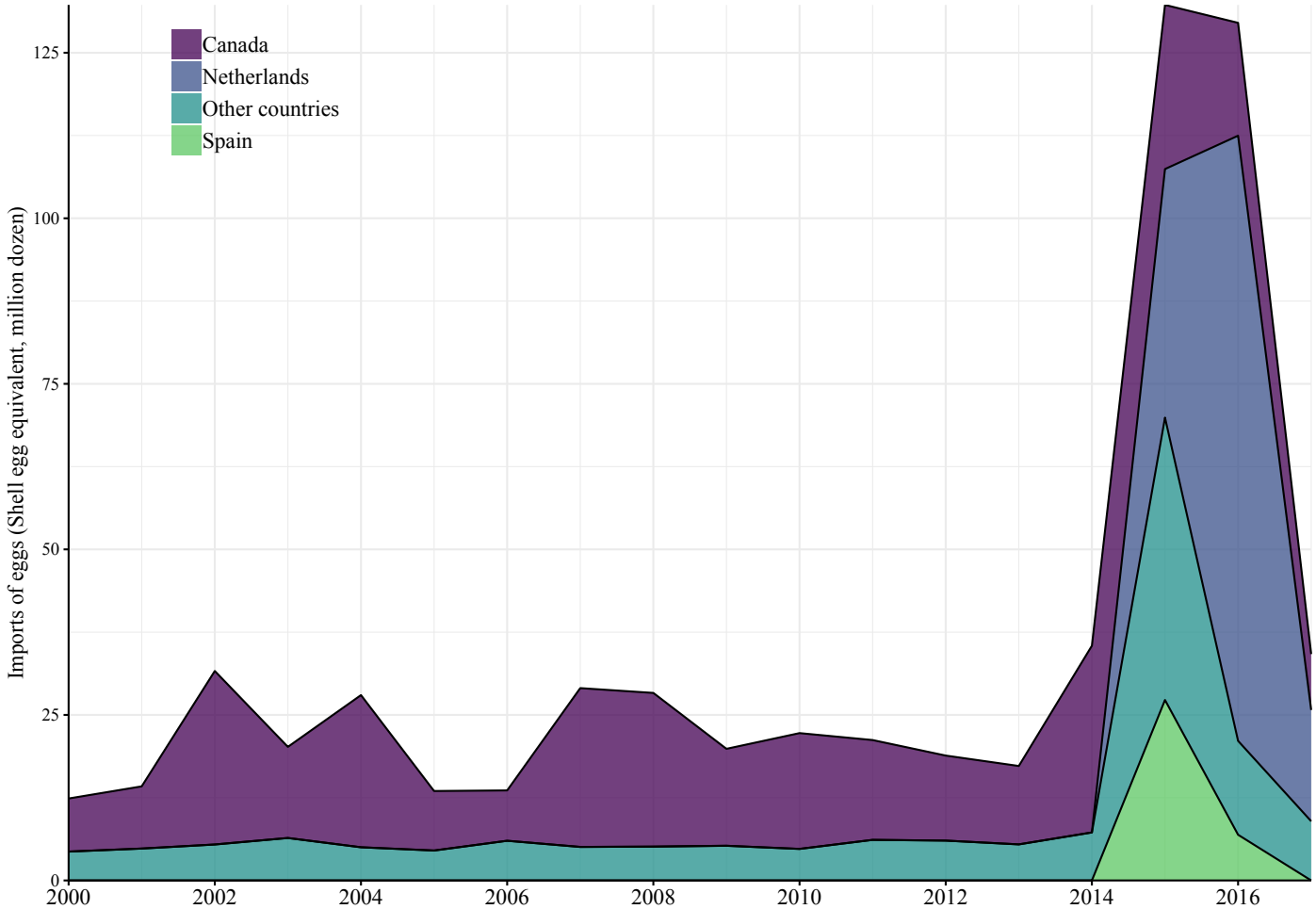


Data source: USDA - Economic Research Service (2018c).

Broiler trade

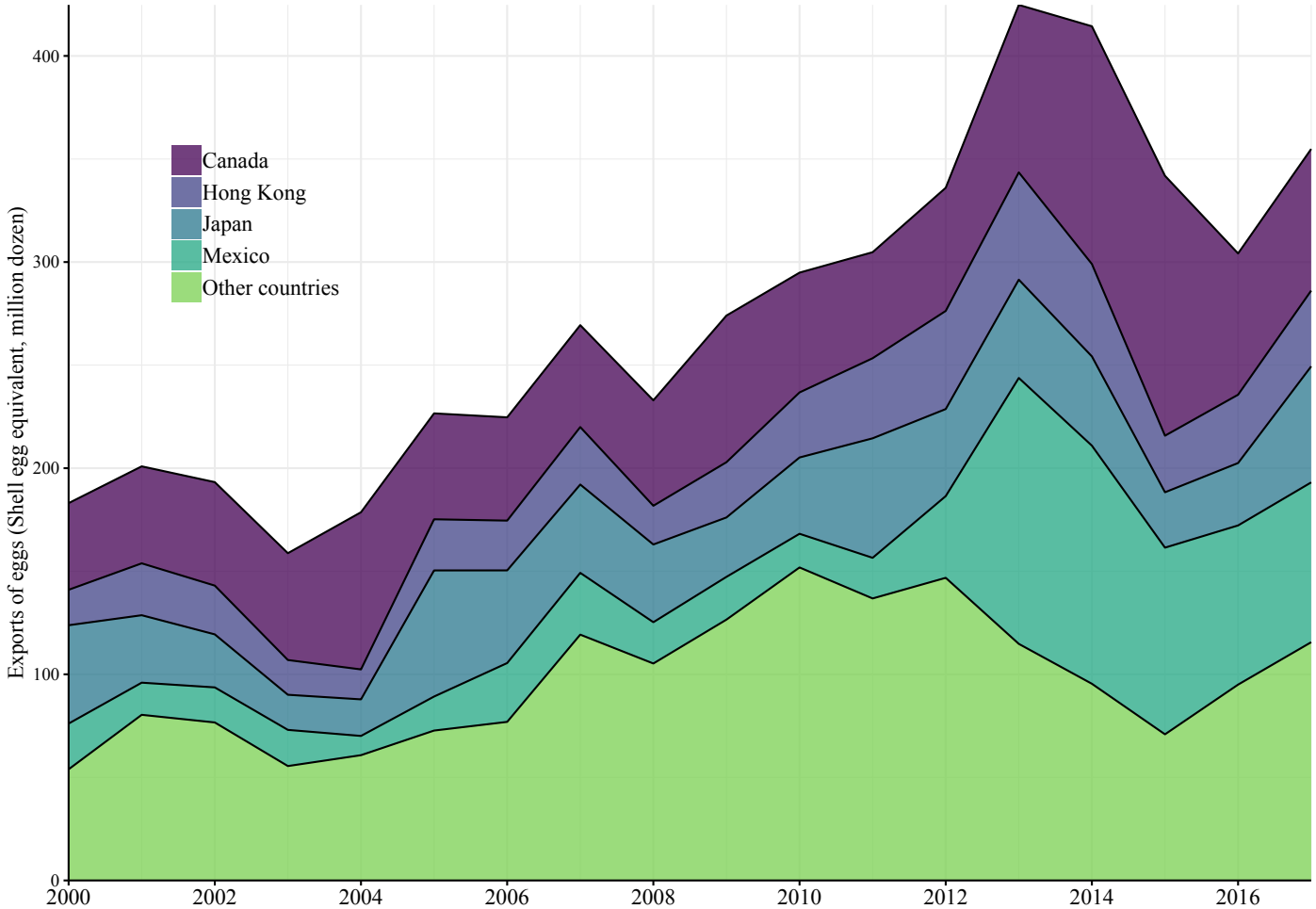
- Note that the United States typically does not trade whole broilers.
- Americans have a preference for white chicken meat while consumers in many other countries prefer dark meat.
- The less valuable dark meat cuts are exported.
- In particular, the United States exports a lot of chicken leg quarters.

Annual egg imports (shelled and products)



Data source: USDA - Economic Research Service (2018c).

Annual egg exports (shelled and products)

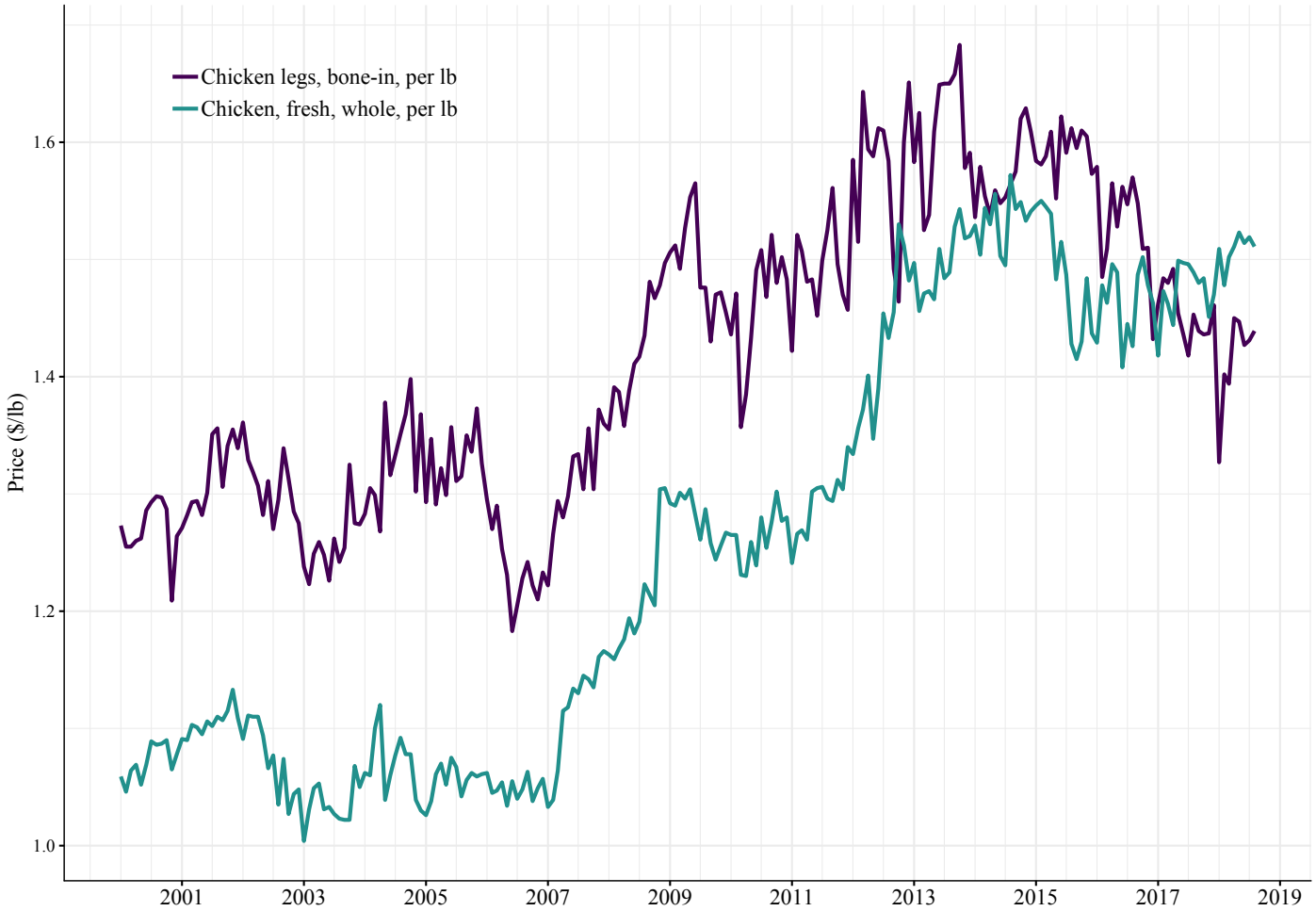


Data source: USDA - Economic Research Service (2018c).

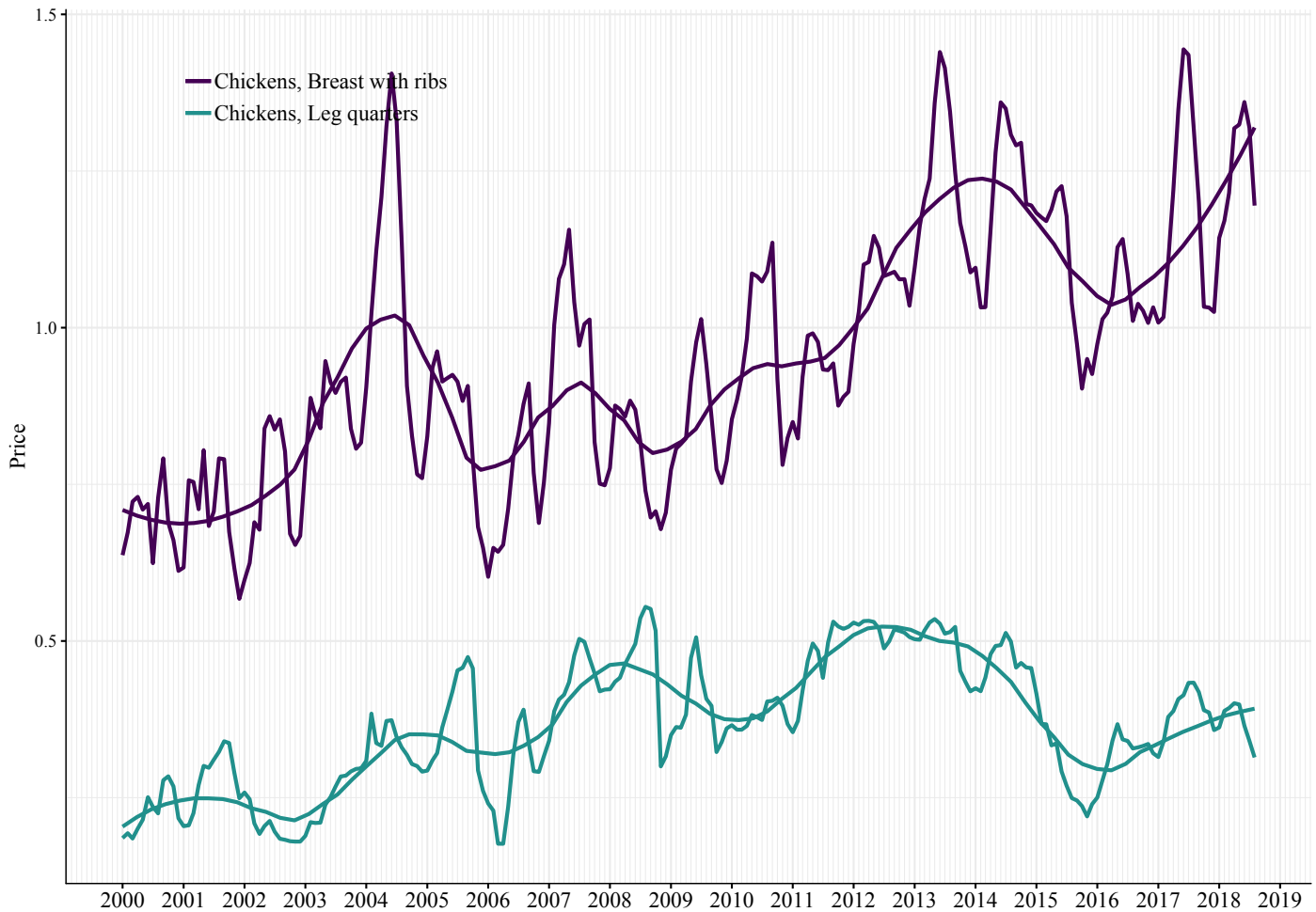
Prices of eggs and chicken

- Most chicken and egg production is under contracts or full integration.
- It makes it impossible to find farm prices for chicken and for eggs.

Retail chicken prices (U.S. city average)

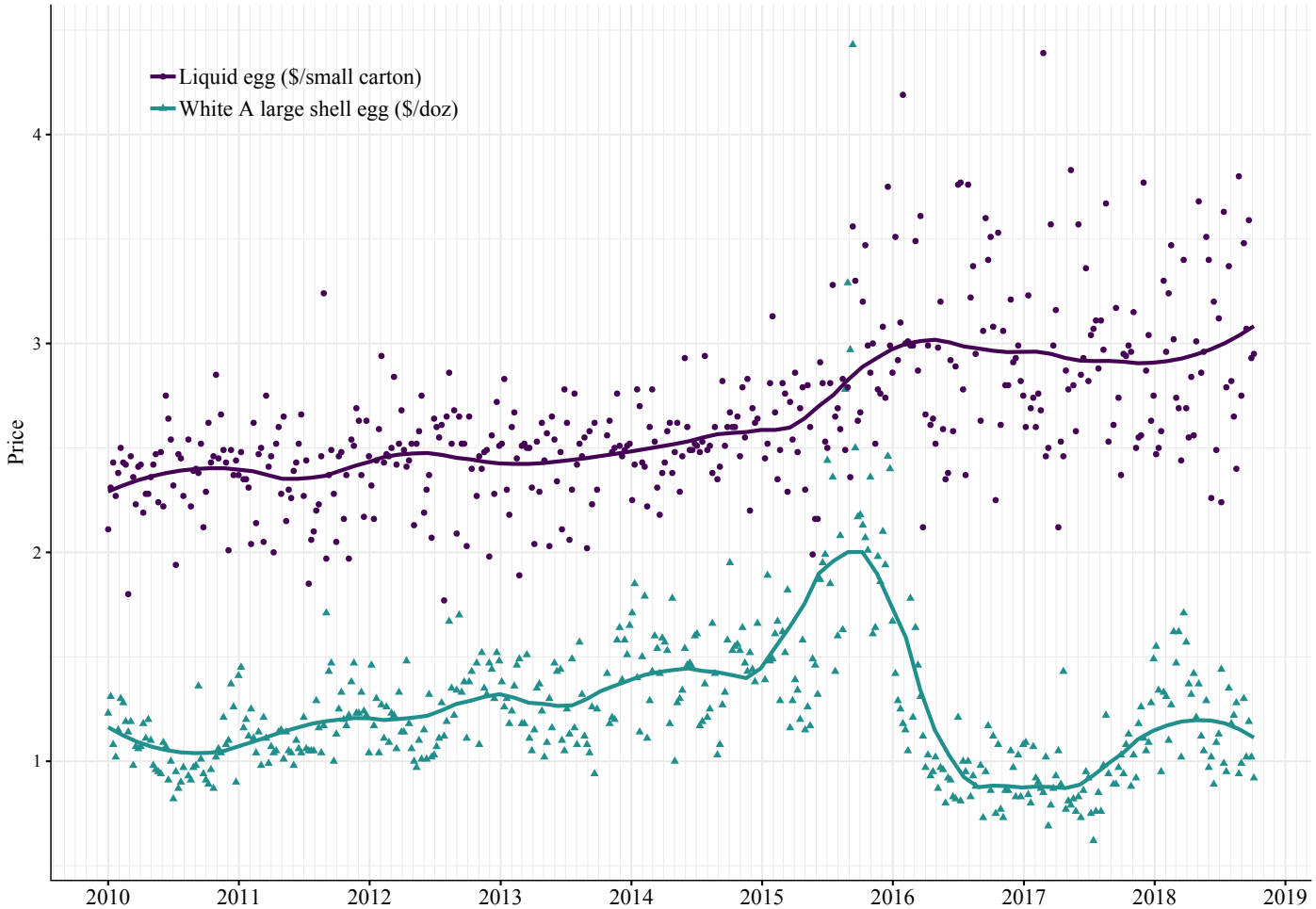


Wholesale chicken prices (Northeast United States)



Data source: USDA - Agricultural Marketing Service (2018)

Retail egg prices



Data source: USDA - Agricultural Marketing Service (2018)

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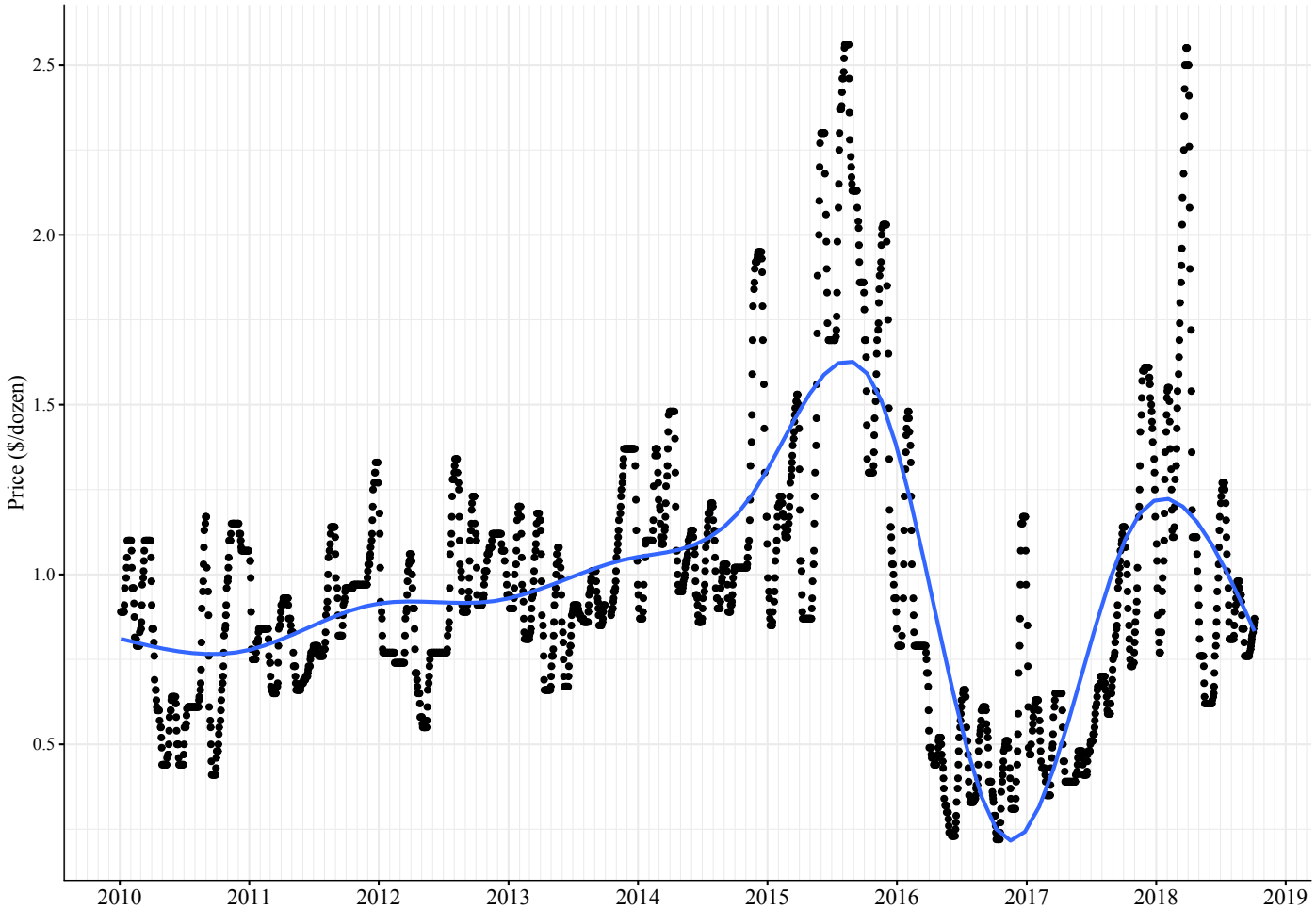
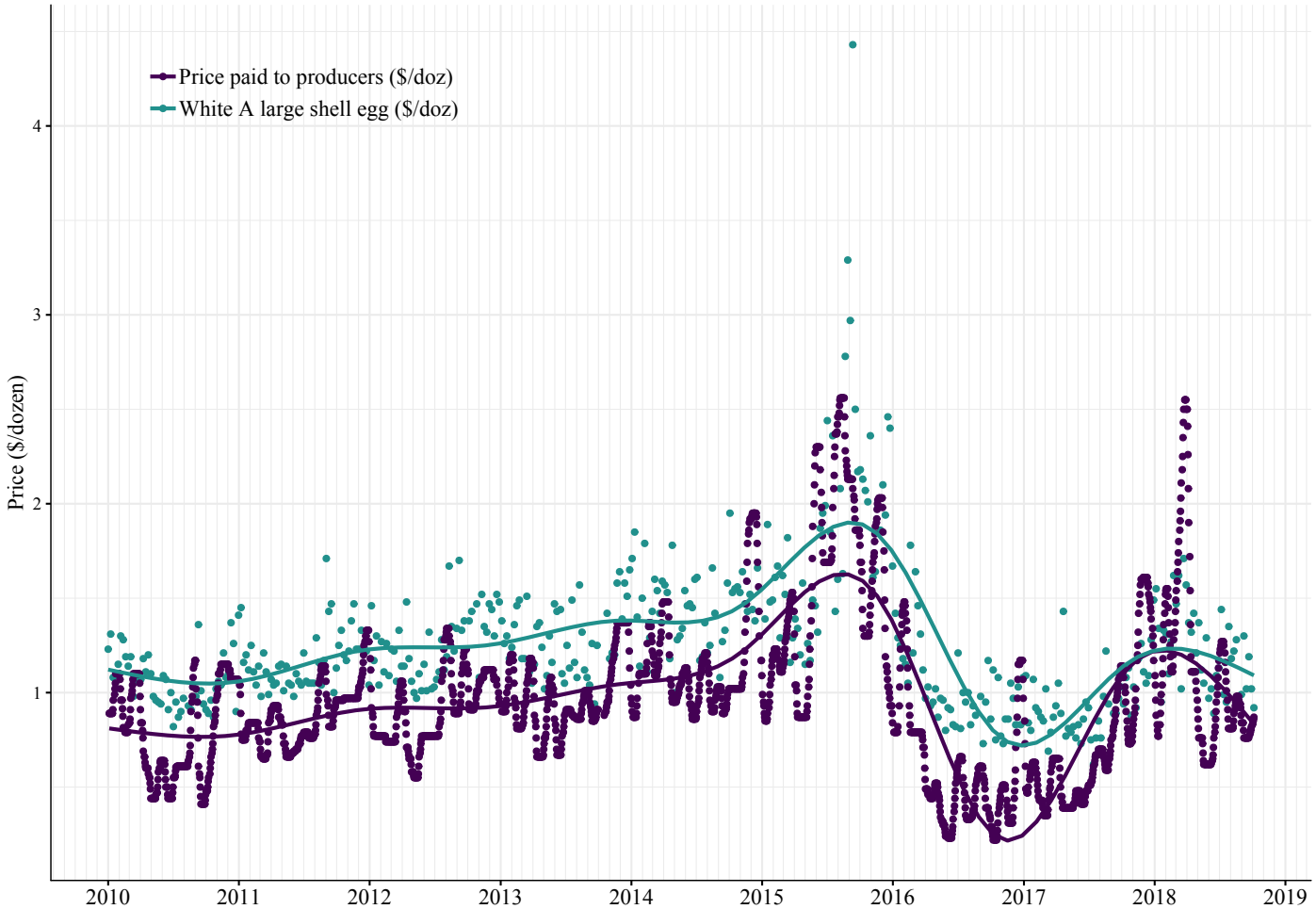


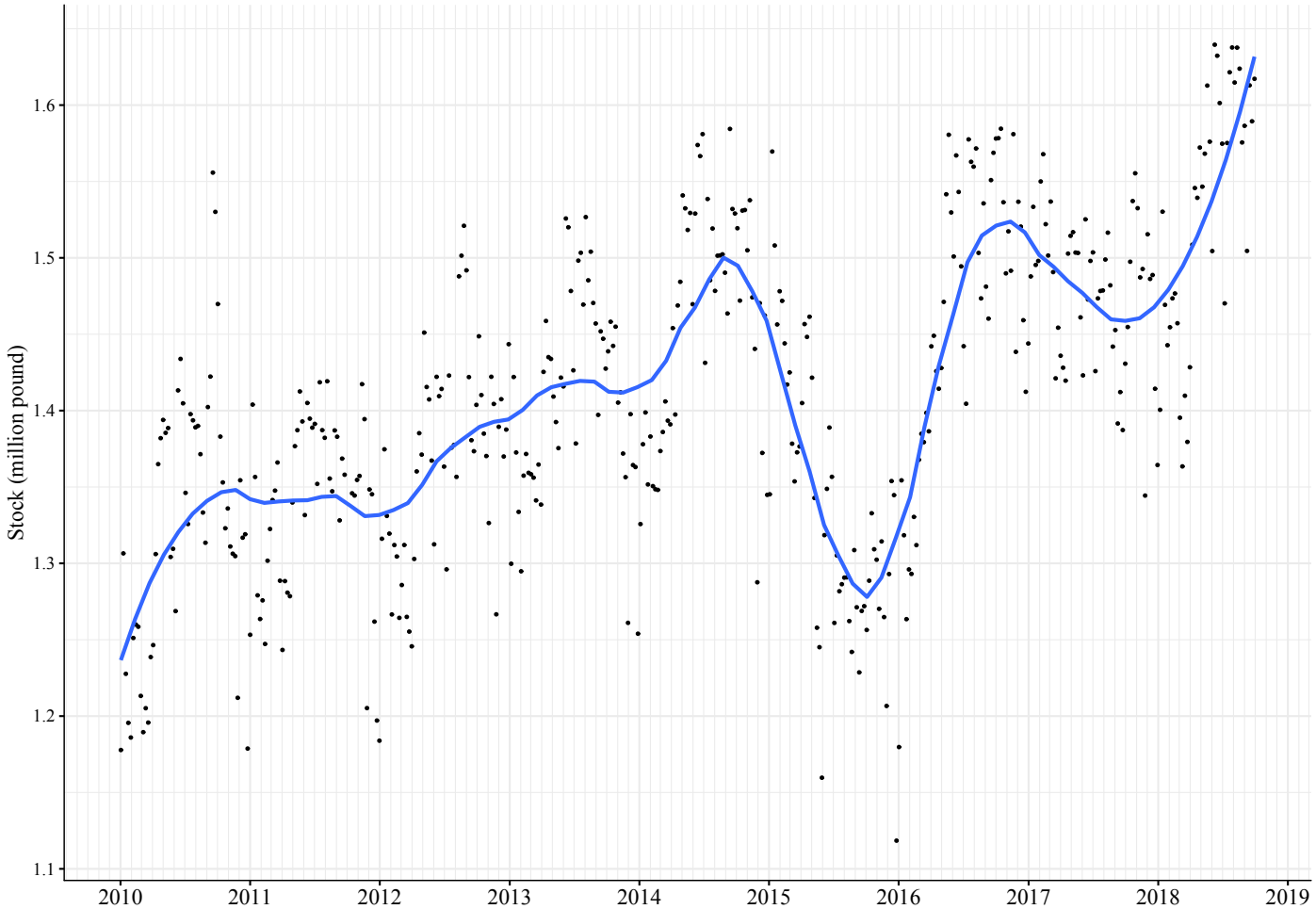
Data source: USDA - Agricultural Marketing Service (2018)

Retail and wholesale prices



Data source: USDA - Agricultural Marketing Service (2018)

Egg stocks

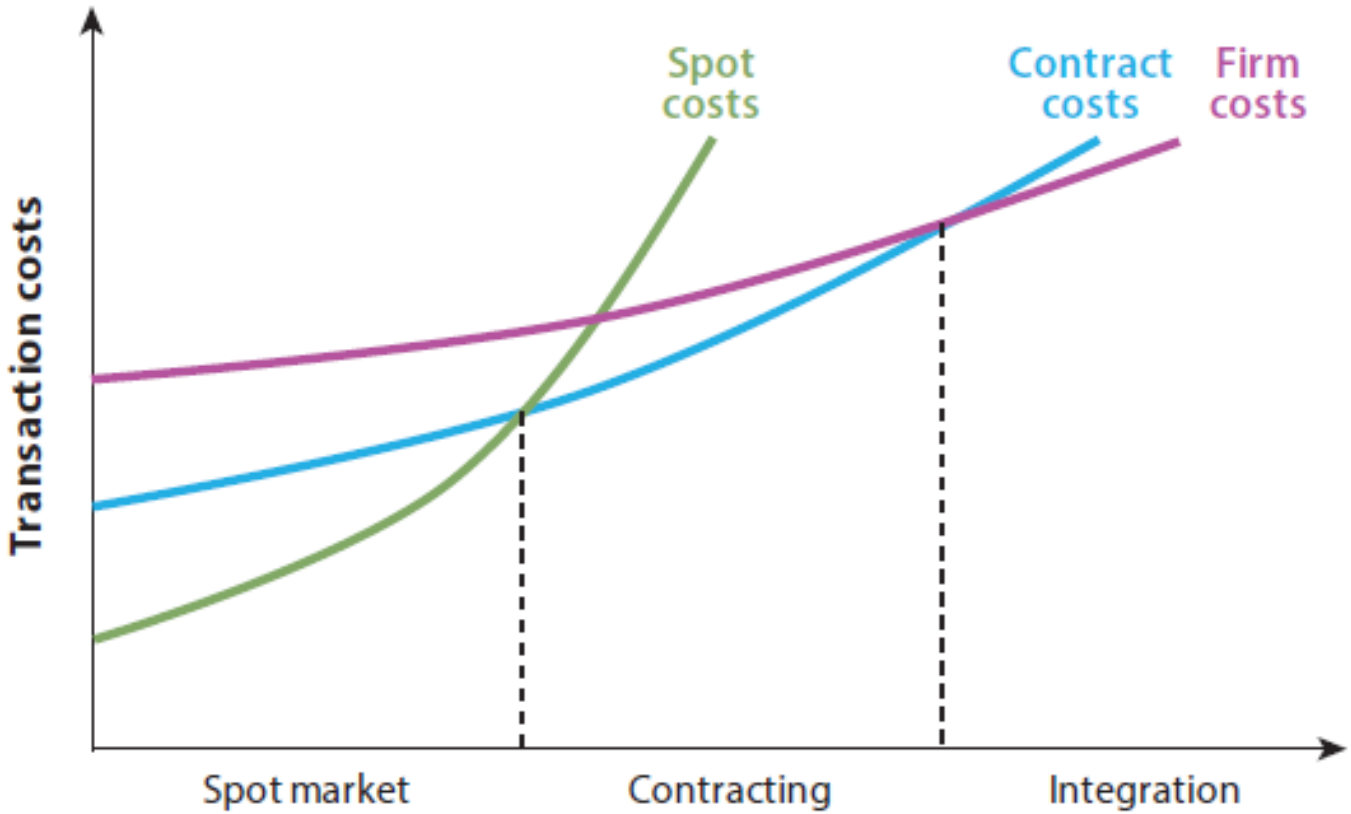


Data source: USDA - Agricultural Marketing Service (2018)

Vertical integration in the chicken industry

- Almost all chicken and egg production are under some form of vertical integration.

Transaction costs and asset specificity



Note: On the horizontal axis is the degree of asset specificity. Source: Crespi and Saitone (2018).

Contract for chicken production

- In a typical contract:
  - The integrator provides the chickens, the feed, veterinarian care and technical;
  - The farmer provides the day to day care of the birds, land and housing on which they're raised, and utilities/maintenance of the housing.
- Payment for the services offered by the farmers uses a `tournament` system.
- https://www.chickencheck.in/faq/chicken-contract-growers/

Vertical integration in the hog industry

- The hog industry uses the spot market, contracts and full integration:
  - Spot market is not very common anymore.
  - Most of the production of hogs is under contract.
  - There is a good share of the production that is under full integration but that is difficult to evaluate how much.
- That is, most of the hog production is under some form of vertical integration (contracts are full integration).

Advantages to vertical integration in the hog industry

- Vertical integration minimizes transaction costs and incentivizes investments in specific assets.
- Some related advantages to vertical integration in the hog industry.
  - Smooths out production cycles, especially seasonal production cycles;
  - This allows to maintain a more uniform production volume throughout the year, reducing packing costs;
  - Reduces price risks;
  - Better control of genetics;
  - Allows for a better control of hog characteristics (e.g. size), reducing packing costs;
  - Facilitates widespread adoption of latest practices and technologies, hence reducing production costs.

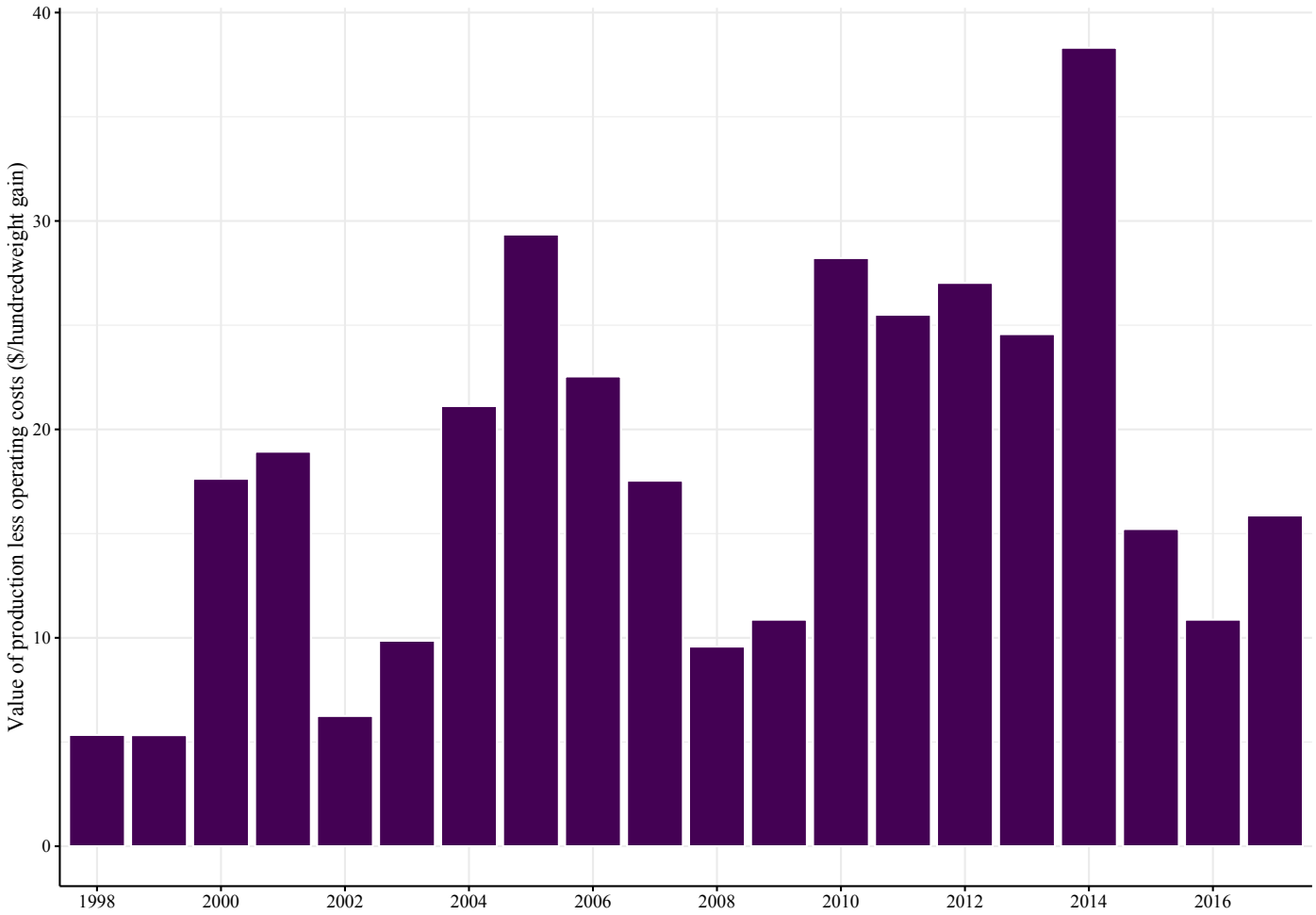
Disadvantages to vertical integration in the hog industry

- There are some disadvantages to vertical integration in the hog industry.
  - Growers partly loose control of their operation;
  - Growers may have limited ability to negotiate the terms of production contracts;
  - Growers retains production risk.
  - There might be a hold up problem where growers invest in specific assets and at the end of a contract they do not have any other option than to contract again with the same integrator.

Vertical integration

- For vertical integration to work, it requires that both the integrators and the growers gain from it.
- Intergators must offer contracts such that some growers will be willing to accept.
- Price for hogs under contract are either negotiated (fixed base price) or determined by formula.
  - Some contracts will also specify premia for grade and yields.

Return to a farrow-to-finish operation in the Heartland



Note: If considering value of production less total costs the returns are negative for several years. Source: USDA - Economic Research Service (2018a).

Marketing methods for hogs

- The same marketing methods for cattle are used in the hog industry.
- However, an important difference is that in addition to the traditional marketing methods, a major part of hog production is under contract.
- Vertical integration means that *integrators*, or *contractors*, contract production for their hogs to independent growers.
- Integrators are packing plants.
- *Full integration* means that a packing plants own facilities for growing hogs and thus control the entire supply chain.
- It is not possible to tell how much of the hog production is under vertical control.
- It is also very difficult to tell whether there is a trend toward more vertical integration and more full integration.
- See some explanations at this link: http://porkgateway.org/resource/producing-and-marketing-hogs-under-contract/.

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Price of weaned and feeder hogs

- Prices for hogs are determined at the intersection of demand and supply.
- An increase in the costs to farrow-to-wean or farrow-to-feeder reduces the supply of weaned pig and feeder pigs.
  - For example, the outbreak of Porcine Epidemic Diarrhea Virus (PEDV) in 2014 reduced yields in farrowing effectively increasing production costs.
  - This shifted the supply of weaned pigs and feeder pigs to the left.
- Many factors affect the demand for weaned pigs and feeder pigs:
  - Feeding costs (e.g. cost and other feeds);
  - Costs at packing plants (e.g. labor costs);
  - Domestic consumer demand (e.g. income, price of substitute products, irrational fear);
  - International consumer demand (e.g. trade agreements, competition from other countries, exchange rate, tariffs).

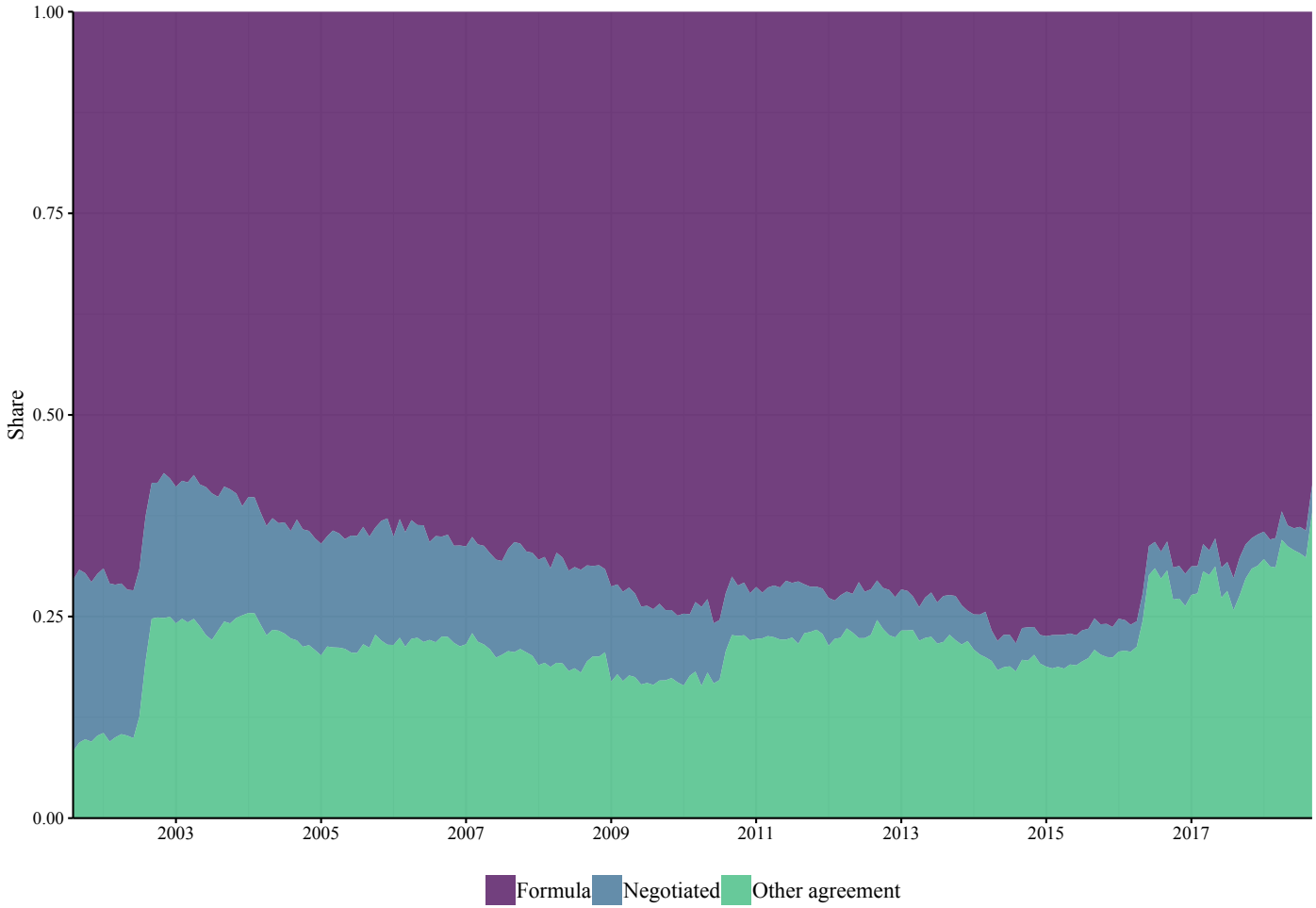
Price of slaughter hogs

- The price of slaughter hogs is determined at the intersection of demand and supply.
- Costs of finishing hogs affect the supply of slaughter hogs:
  - Includes the cost of younger pigs (weanlings, feeders);
  - Cost of feed (e.g. corn);
  - Because PEDV shifted the supply of weanlings and feeders, it also shifted to the left the supply of market hogs.
- Many factors affect the demand for market hogs:
  - Costs at packing plants (e.g. labor costs);
  - Domestic consumer demand (e.g. income, price of substitute products);
  - International consumer demand (e.g. trade agreements, competition from other countries, exchange rate, tariffs).
- Characteristics of a pigs (e.g. breed, weight, color) explain difference in prices across pigs.

Hogs prices

- Throughout the supply chain, the characteristics of hogs affect their prices.
- Quality is difficult to observe but hogs tend to be more homogenous than cattle.
  - There are more breed variety in cattle (southern versus northern breeds, dairy).
- The methods to price hogs in direct sales or contracts are very similar to those for direct sales for cattle.
  - For that reason they are not covered here.
- The number of hogs sold live is small.
- There are hogs that are sold between packers:
  - A packer might have more hog produced in an area than it can processed nearby;
  - Temporary slow down in packing operations.

Negotiated versus formula - producer sold, carcass basis



Carcass grading

- Packers use different matrices to reward the characteristics that they find desirable.
  - Packers offer different pork products to consumers and hence they look into different quality attributes into hog carcasses.
- The characteristics considered include:
  - Backfat thickness;
  - Loineye area;
  - Loin depth.
- The net price is calculated from a base price to which are added discounts and premia depending on the characteristics of a carcass.

What are the discounts and premia

- The USDA reports price ranges based on measured backfat thickness, loineye area and loin depth.
- This information is available in report `lm_hg200`: https://www.ams.usda.gov/mnreports/lm_hg200.txt.

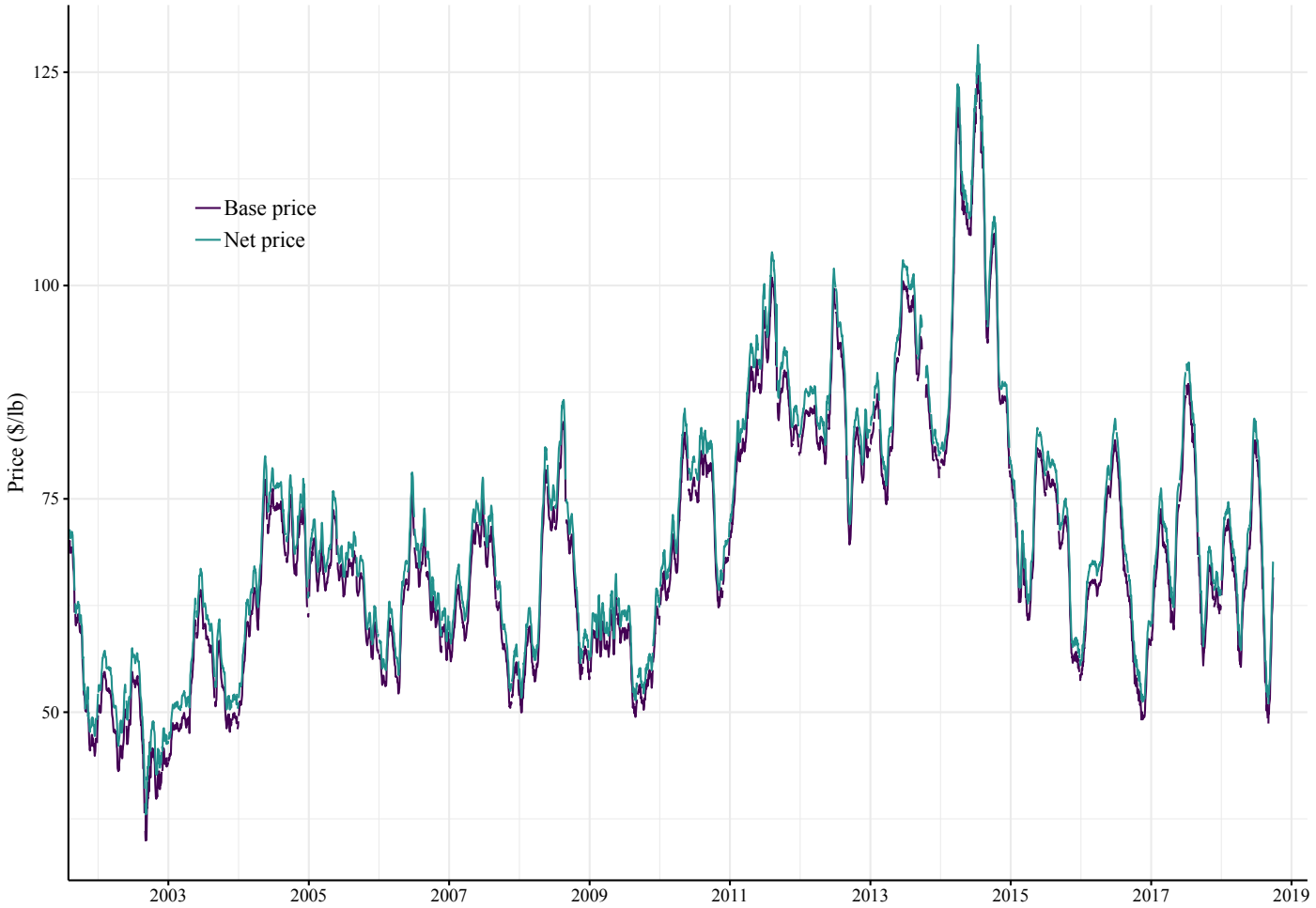
Example matrix from USDA report lm_hg200

- Below is an example of the range of prices paid for negotiate hog prices for given backfat thickness, loineye area and loin depth.

NATIONAL DAILY DIRECT NEGOTIATED HOG PURCHASE MATRIX
REPRESENTING INDIVIDUAL PACKER CARCASS MERIT BUYING PROGRAMS
based on both Fat and Muscle Measurements for a 200 lb Carcass Basis
LOIN AREA/DEPTH (INCHES)

BF	4.0/ 1.4		5.0/ 1.7		6.0/ 2.0		7.0/ 2.3		8.0/ 2.7	
0.4	61.00	67.57	62.50	68.90	63.50	70.23	64.50	71.56	65.00	73.33
0.5	58.00	67.57	61.00	68.90	63.50	70.23	64.00	71.56	65.00	73.33
0.6	58.00	66.31	61.00	67.64	62.50	68.96	63.50	70.29	64.50	72.06
0.7	58.00	65.04	58.00	66.37	61.00	67.70	63.50	69.03	64.00	70.80
0.8	57.00	63.78	58.00	65.10	61.00	66.43	62.50	67.76	64.00	69.53
0.9	57.00	62.51	58.00	63.84	58.00	65.17	61.00	66.50	62.50	68.27
1.0	55.00	61.25	57.00	62.57	58.00	63.90	61.00	65.23	62.50	67.00
1.1	54.00	59.66	57.00	61.00	58.00	62.32	58.00	63.65	61.50	66.50
1.2	54.00	58.00	55.00	59.09	57.00	61.00	57.50	62.00	59.50	65.00
1.4	49.50	54.50	50.87	58.00	52.20	59.00	53.53	61.00	55.30	62.00

Base price and net price - producer sold



Mandatory price reporting (MPR)

- MPR also applies to the hog industry.

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Crespi, J. M. and Saitone, T. L. (2018). Are cattle markets the last frontier? vertical coordination in animal-based procurement markets. *Annual Review of Resource Economics*, 10(1):null.

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