Poultry and eggs

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 poultry are very short and essentially inexistent. However, seasonality used to be a problem.

Introduction

- We will focus on the chicken industry and briefly look into the egg industry.
- We will begin with definitions, review some market data and look into how contracts in the poultry industry work.

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 (as opposed to fertilized eggs).
- Shell eggs: Eggs sold in cartons.
- Breaker eggs: Eggs grown for breaking and used in the food industry. They can be sold liquid, dried or frozen.

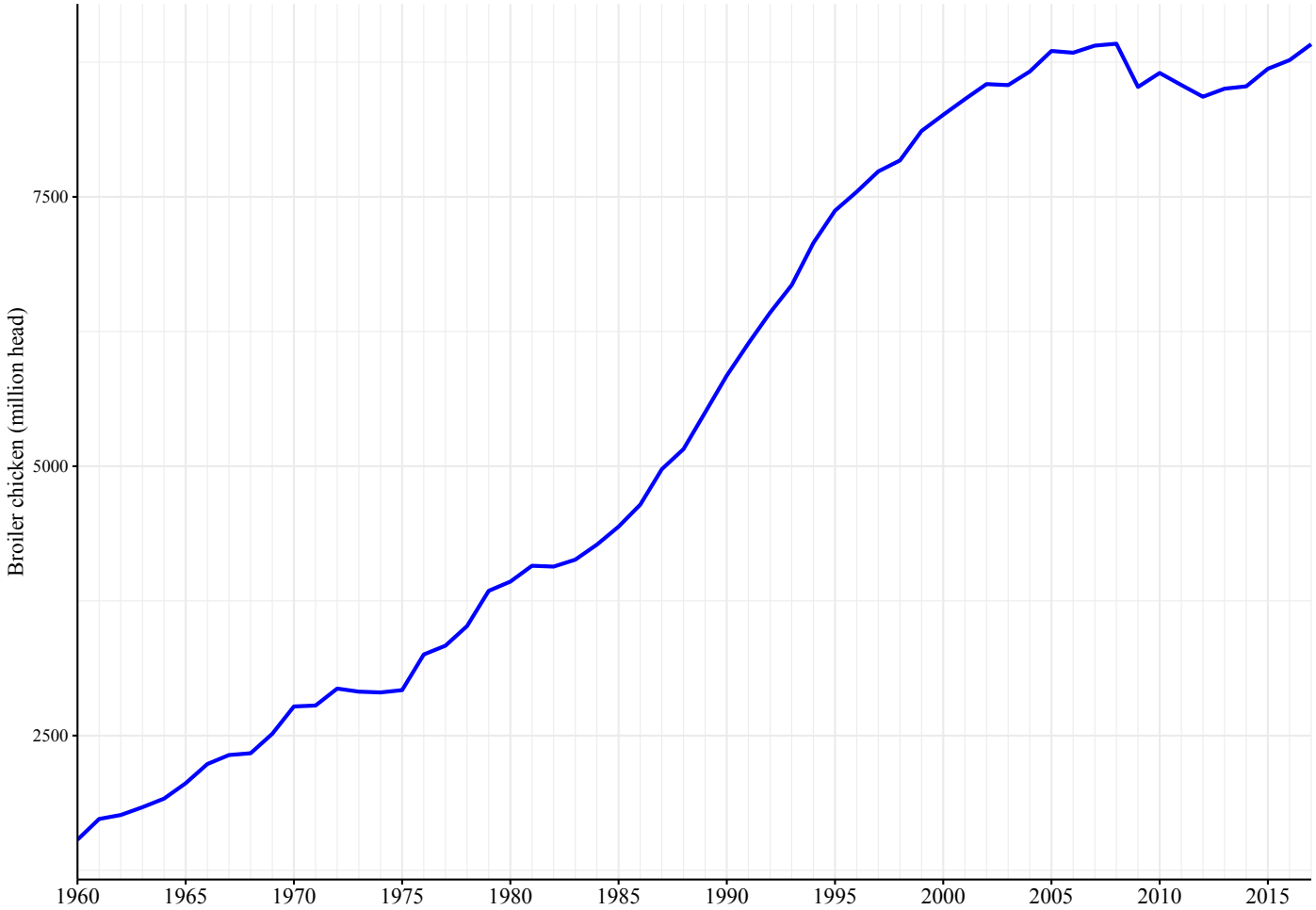
Supply chain

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

Supply chain

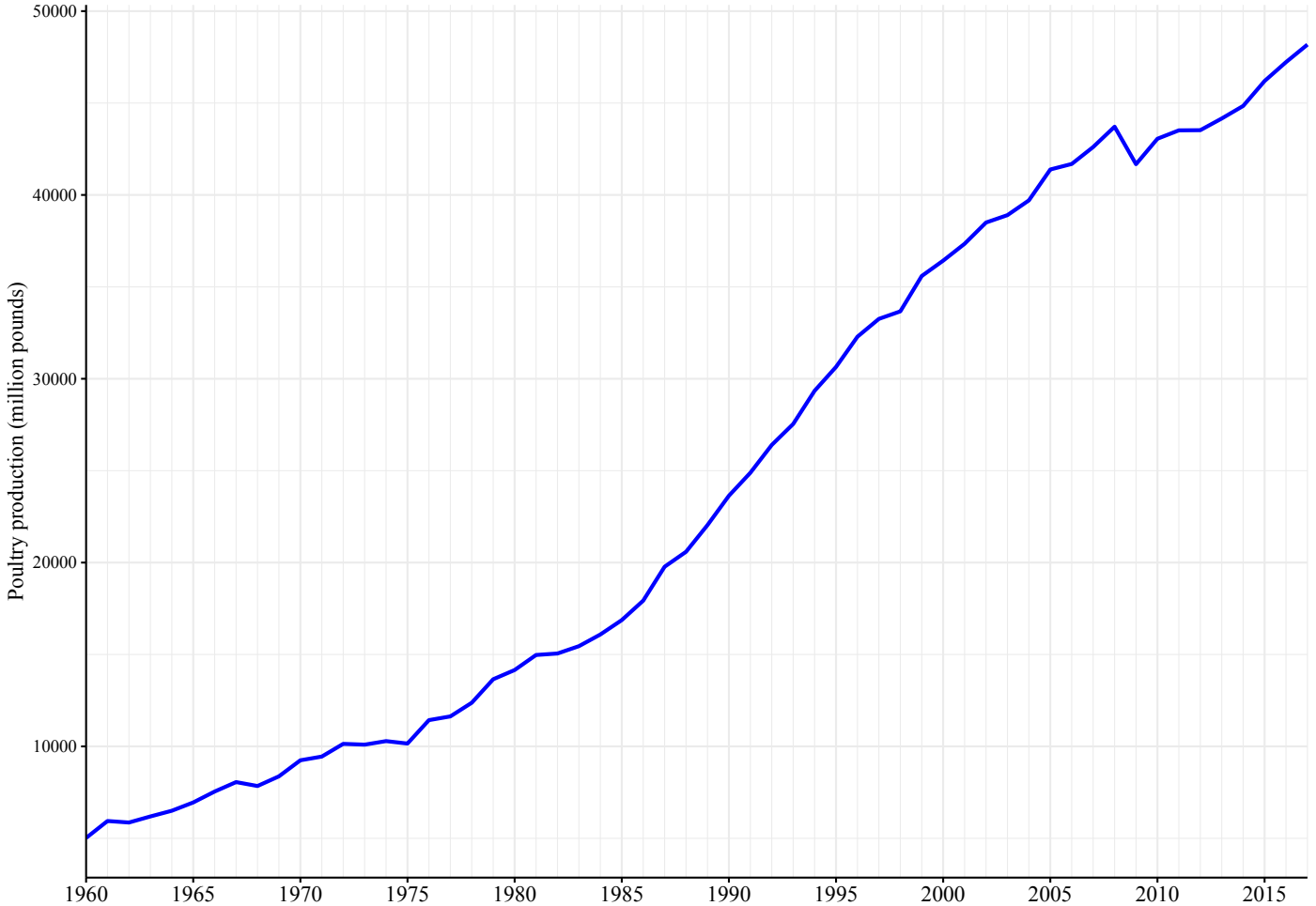
- Egg industry:
  - Breeder farms raise hens and roosters to produce fertilized eggs.
  - Hatcheries: Hatch the eggs and select the hens.
  - Egg farms: Harvest eggs from egg-laying hens.

Annual commercial broiler chicken slaughter



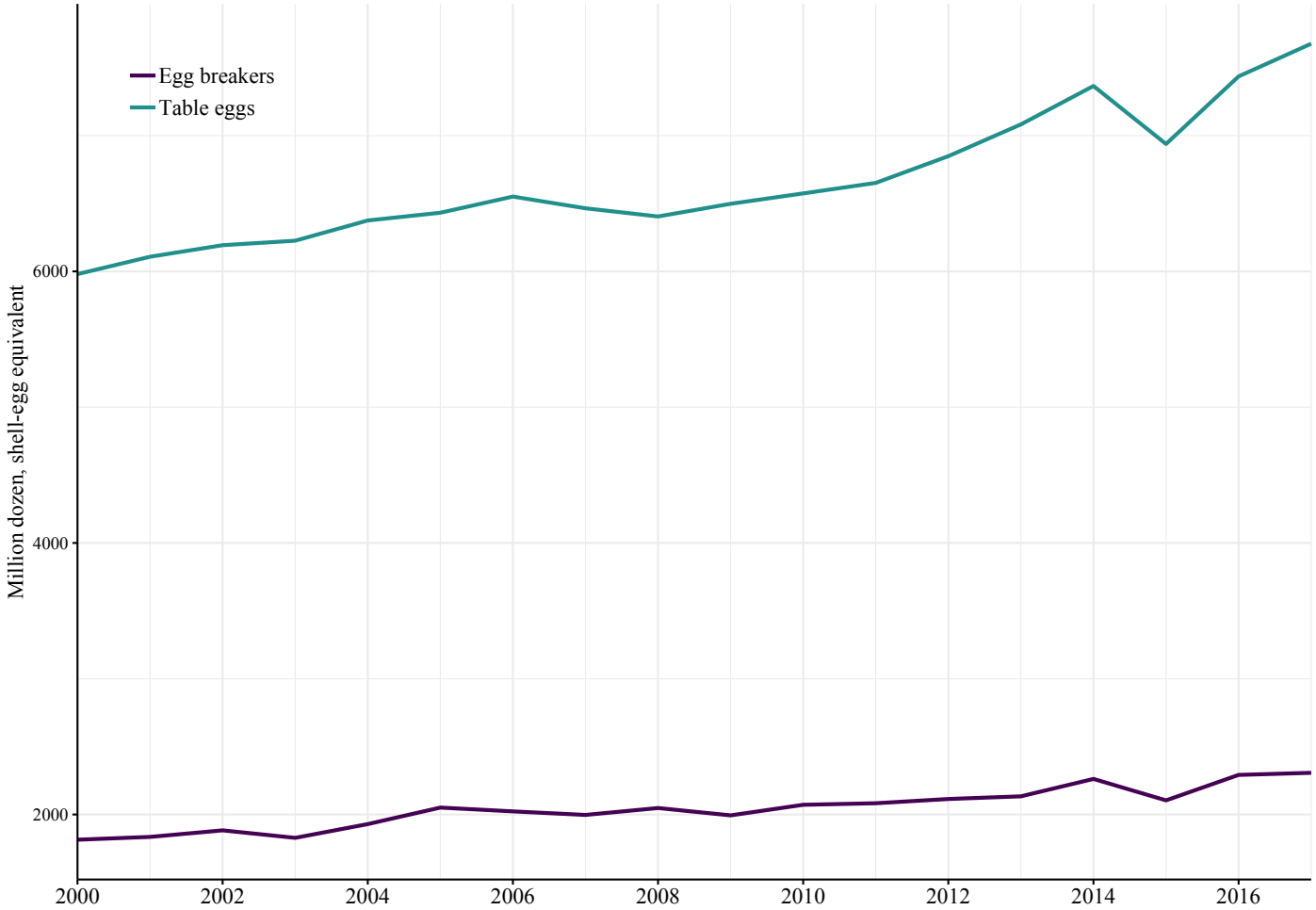
Data source: USDA - Economic Research Service (2018b).

Annual poultry production



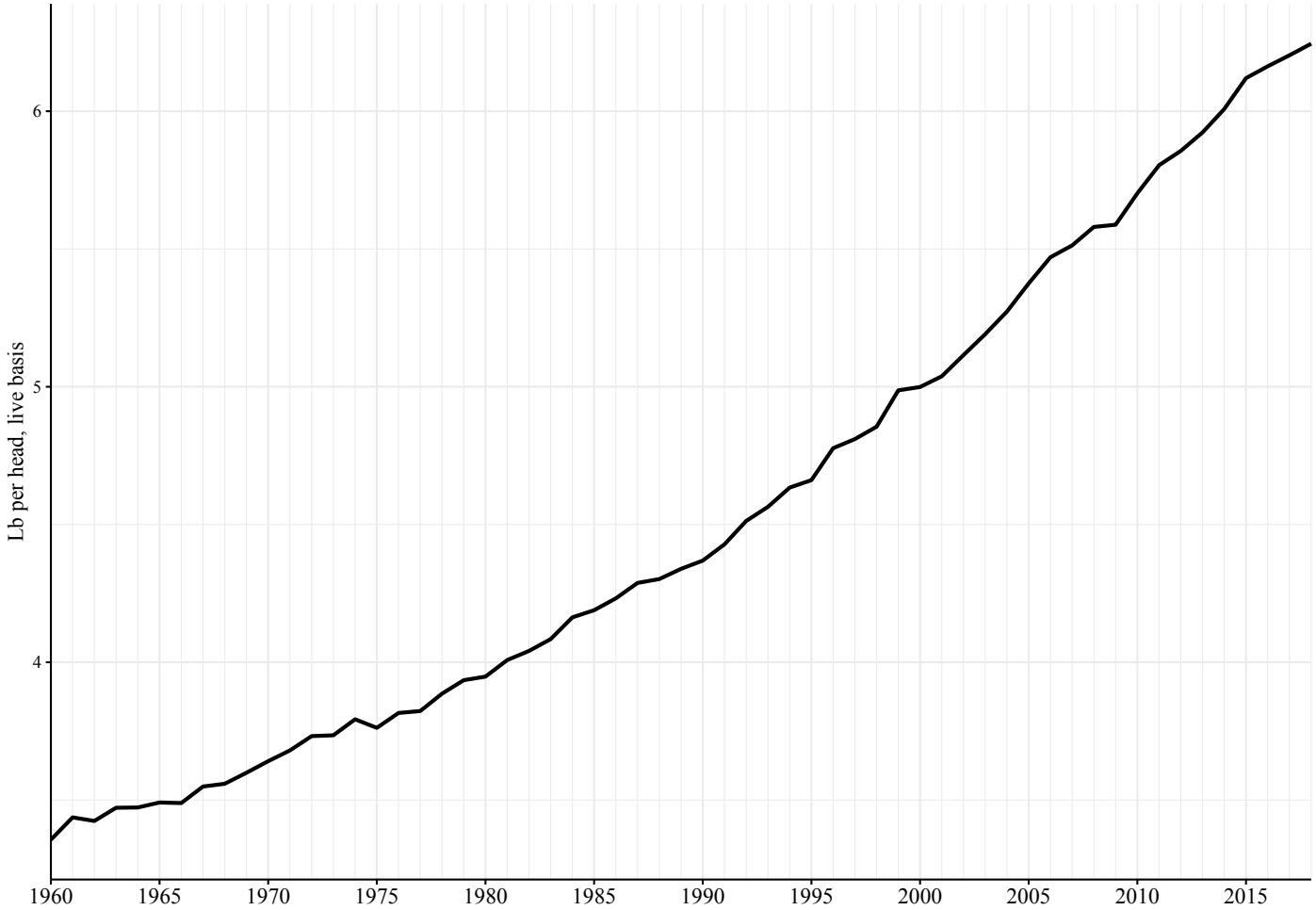
Note: Total poultry includes chicken and turkey. Data source: USDA - Economic Research Service (2018b).

Table eggs and egg breakers annual production



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

Broilers weight (live basis)



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

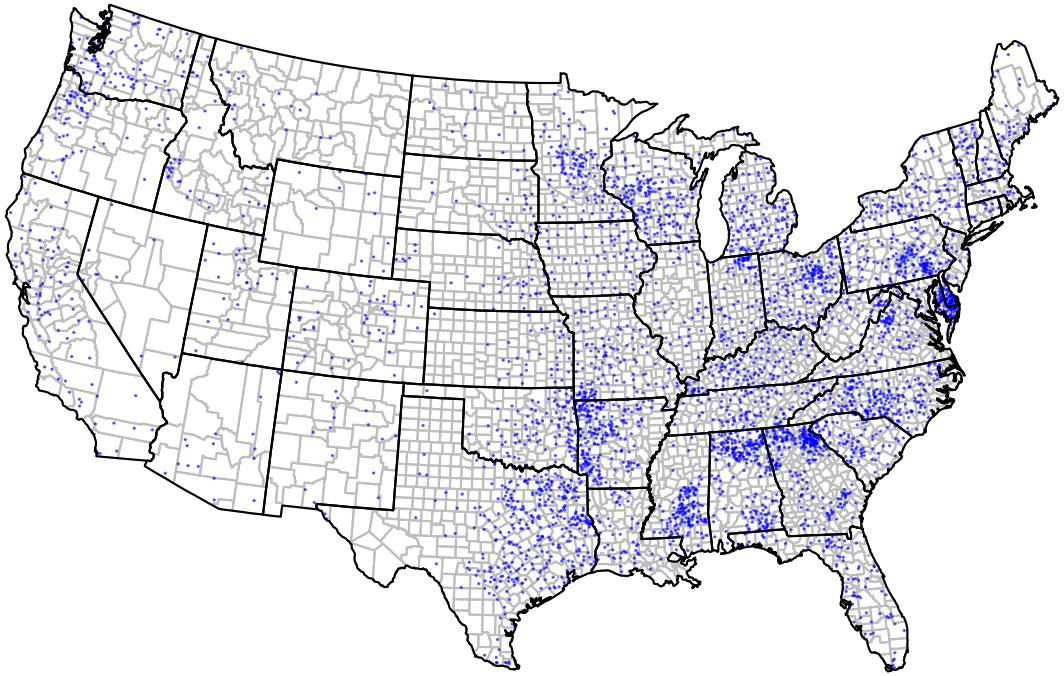
Chicken broiler production by state (2017)

State	Value
Alabama	1095.4
Arkansas	1059.0
Georgia	1363.4
Mississippi	741.1
Other states	4654.1

Note:
Million heads

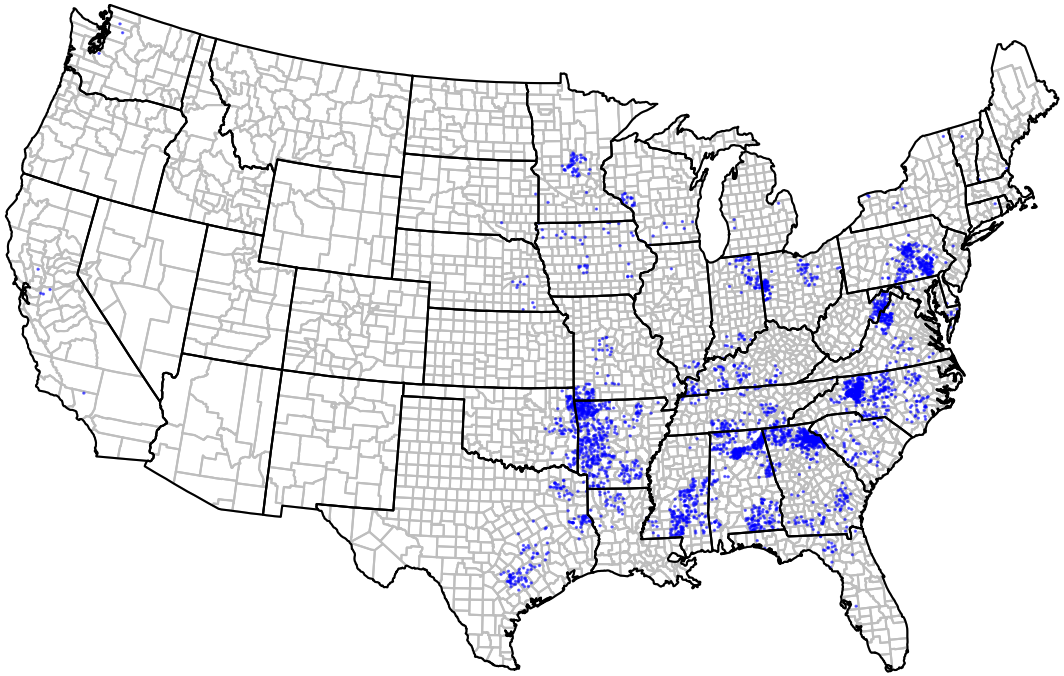
Data source: USDA - National Agricultural Statistics Service (2018).

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



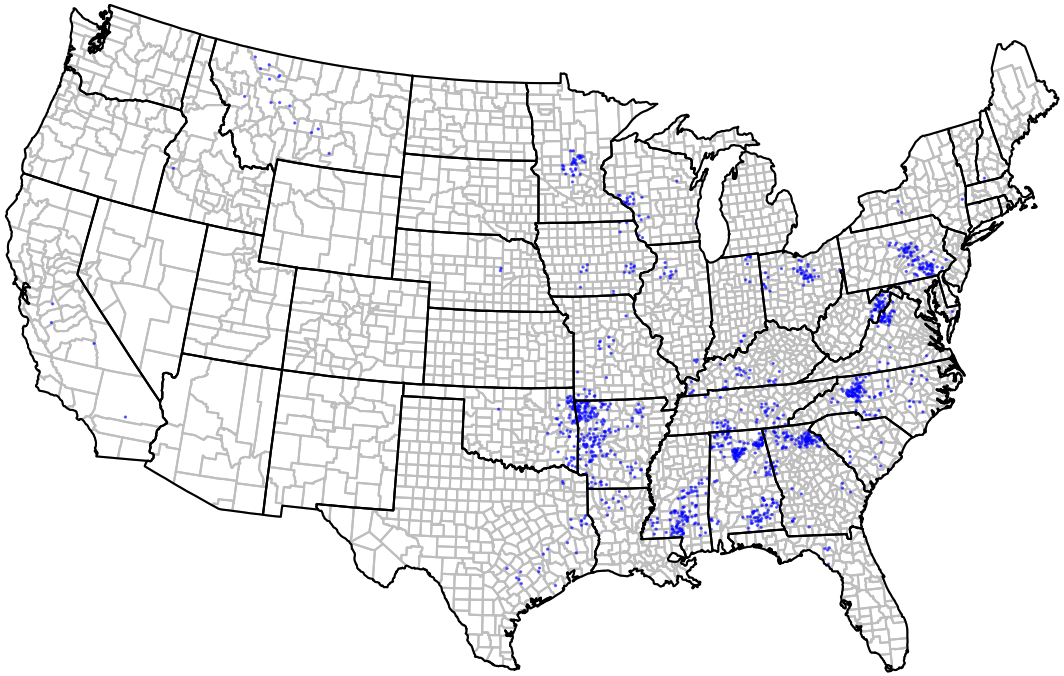
This is a density dot map where each dot represents about 10 operations, randomly located within a county. Data source: USDA - National Agricultural Statistics Service (2018).

All egg farms with production contracts (2012 census of agriculture)



This includes farms that produce table eggs and fertilized eggs. 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).

All egg farms with more than 10,000 layers (2012 census of agriculture)



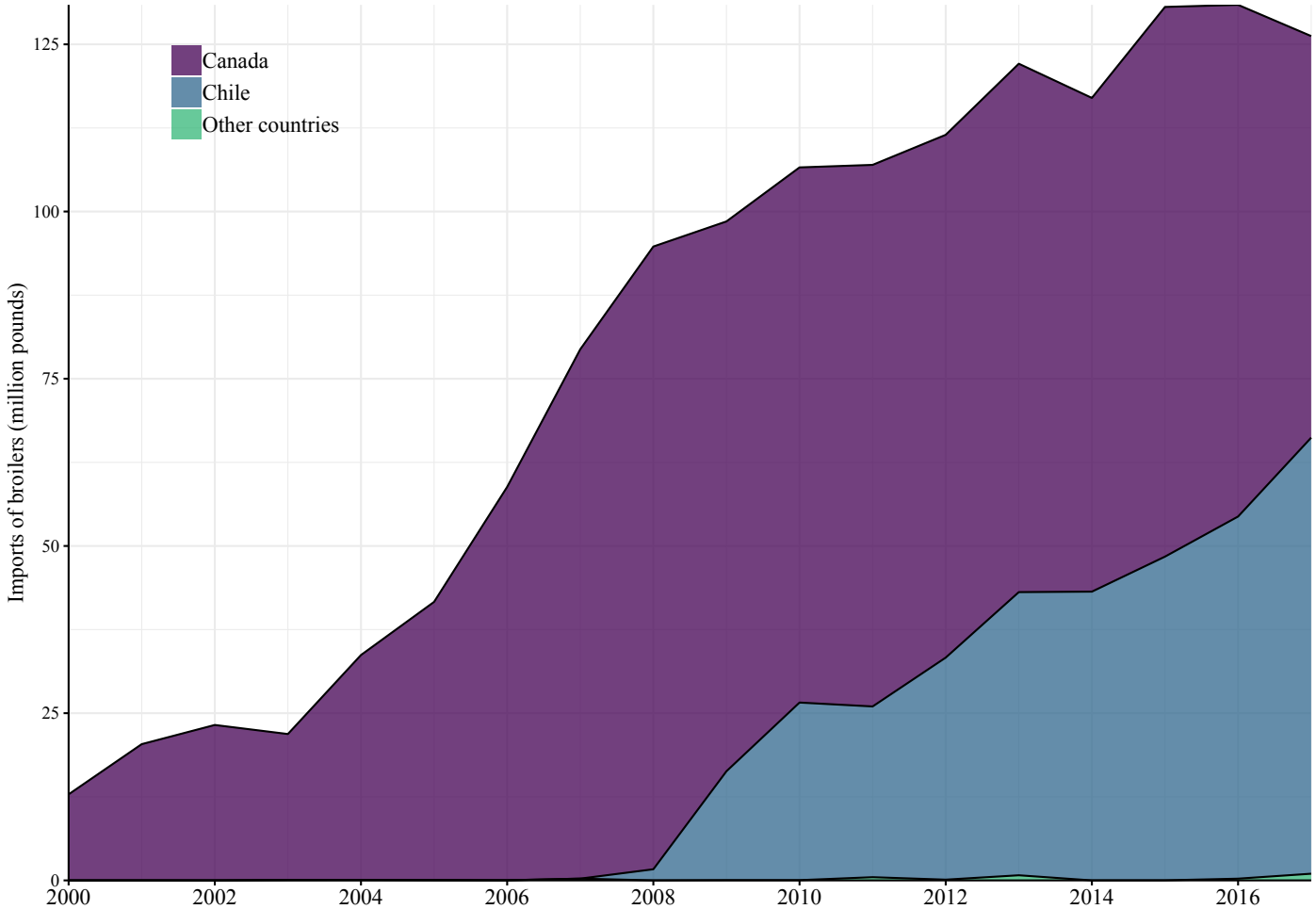
This includes farms that produce table eggs and fertilized eggs. This is a density dot map where each dot represents about 1 operation, randomly located within a county. Data source: USDA - National Agricultural Statistics Service (2018).

Table eggs production by state (2017)

State	Value
Indiana	782.6
Iowa	1313.2
Minnesota	251.9
Other states	1486.5
Pennsylvania	654.4
Note:	
Million dozens	

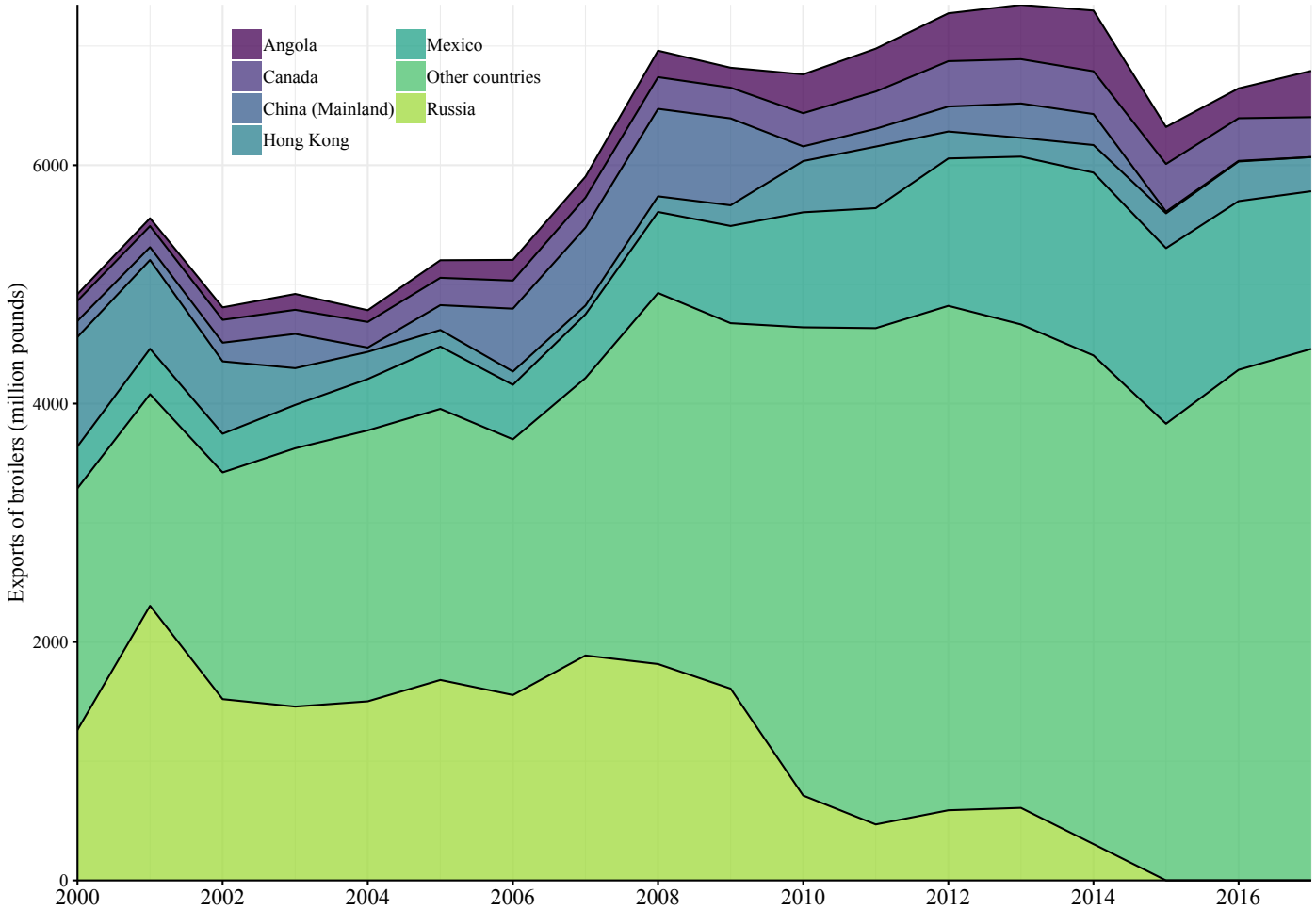
Data source: USDA - National Agricultural Statistics Service (2018).

Annual broiler imports



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

Annual broiler exports

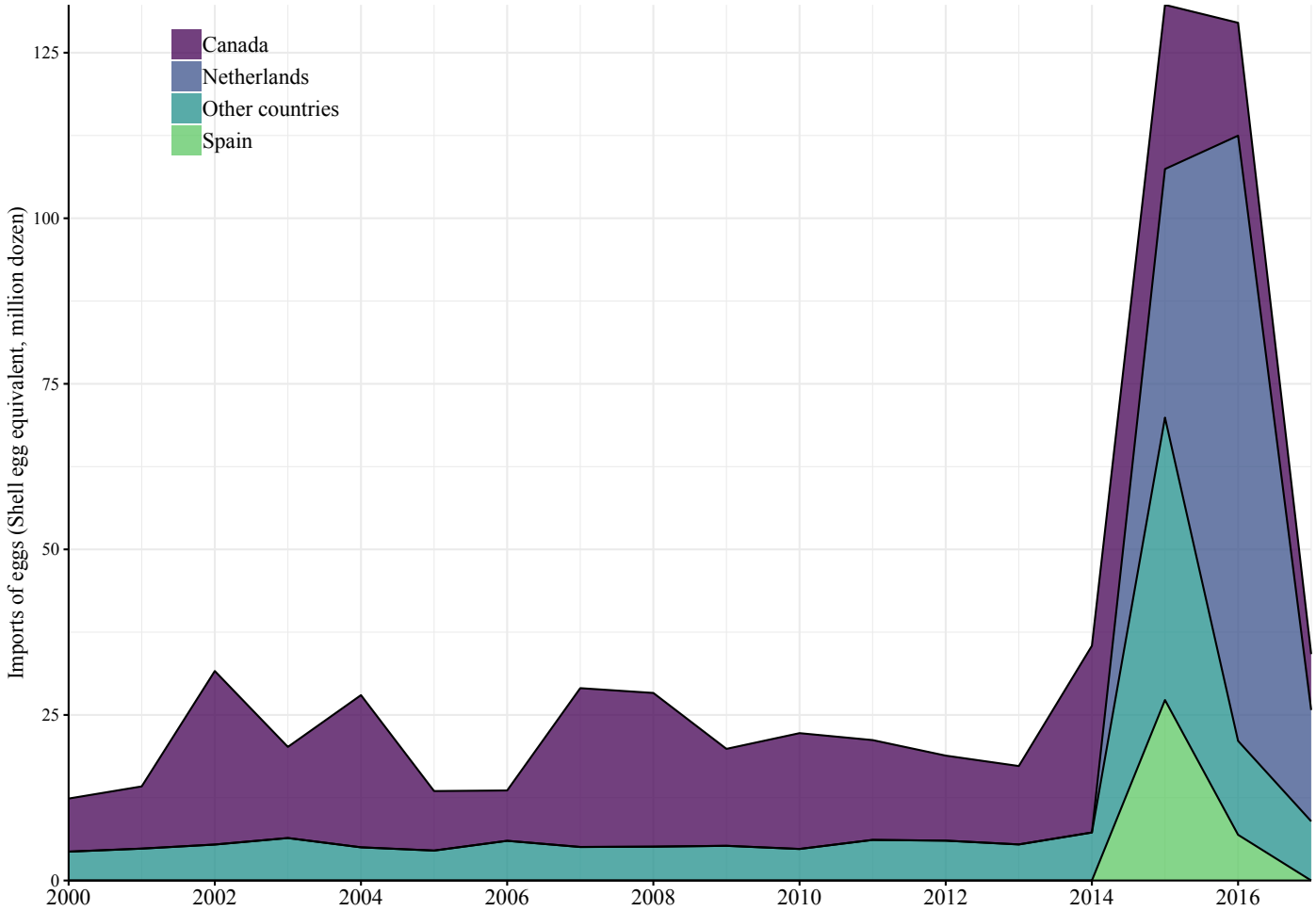


Data source: USDA - Economic Research Service (2018c).

Broiler trade

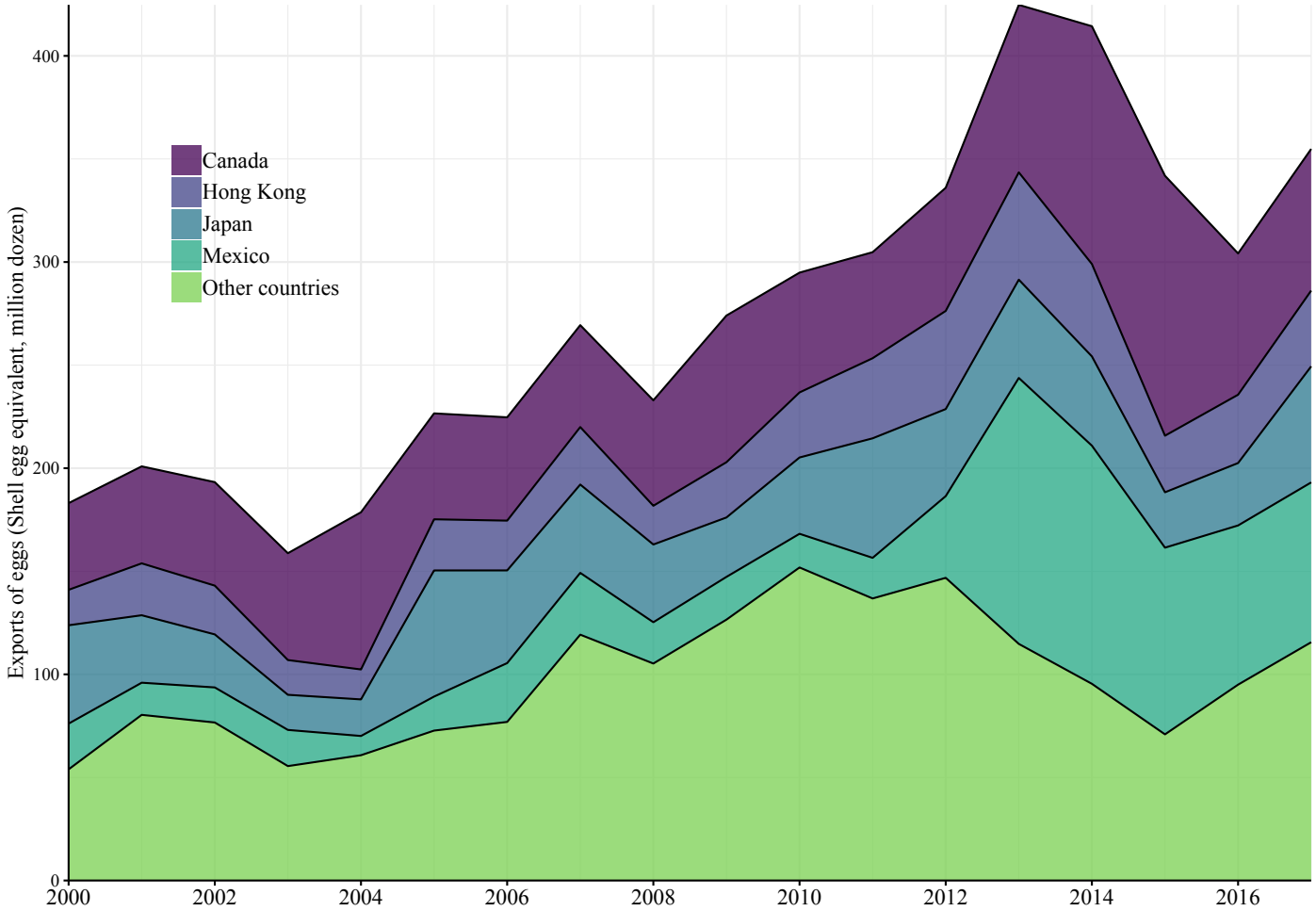
- Note that the United States typically does not trade whole broilers.
- Americans have a preference for white chicken meat (breasts) while consumers in many other countries prefer dark meat (legs).
- White meat is more expensive than brown meat in the United States (see graph of wholesale prices below).
- 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)

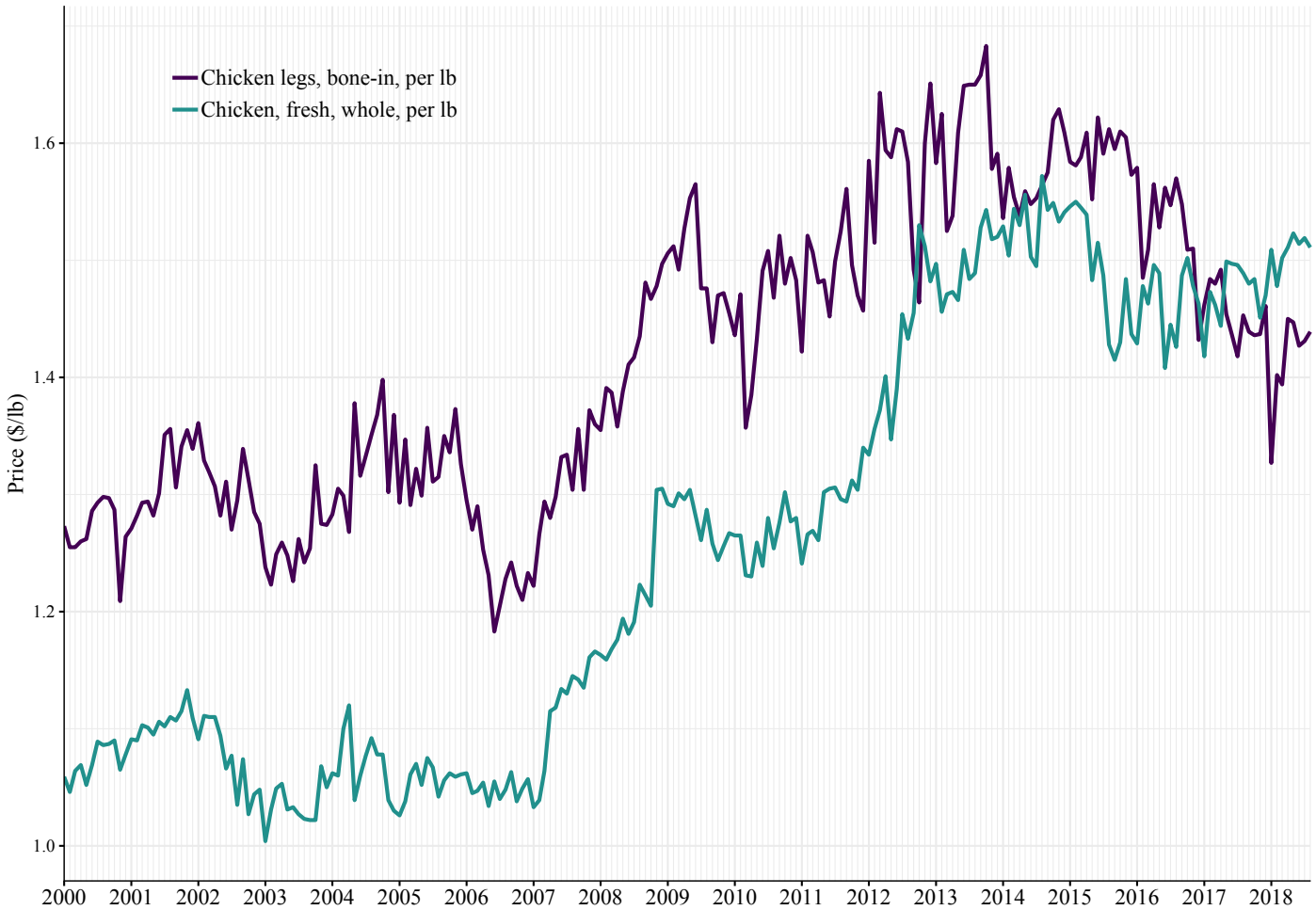


Data source: USDA - Economic Research Service (2018c).

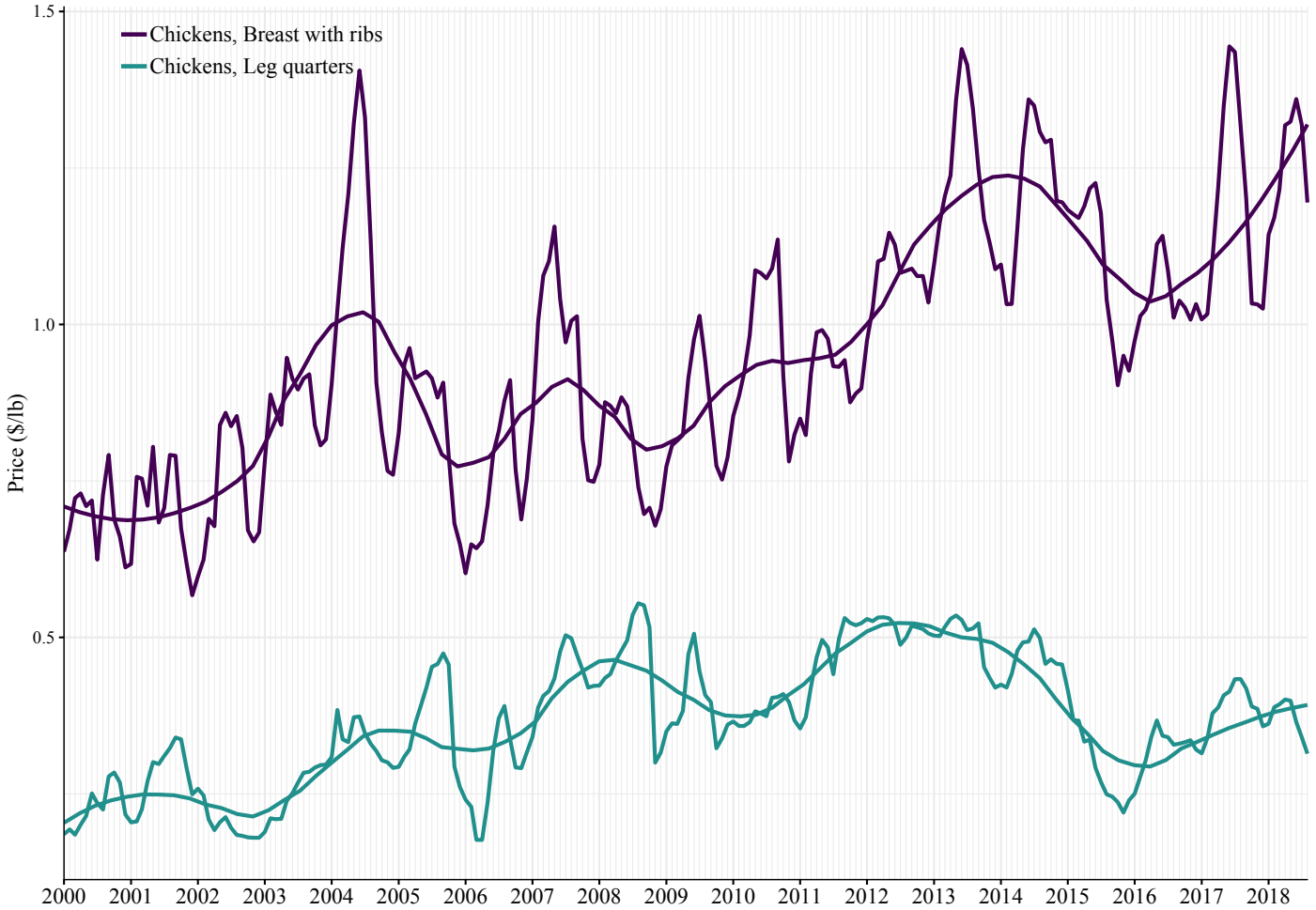
Prices of eggs and chicken

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

Retail chicken prices (U.S. city average)

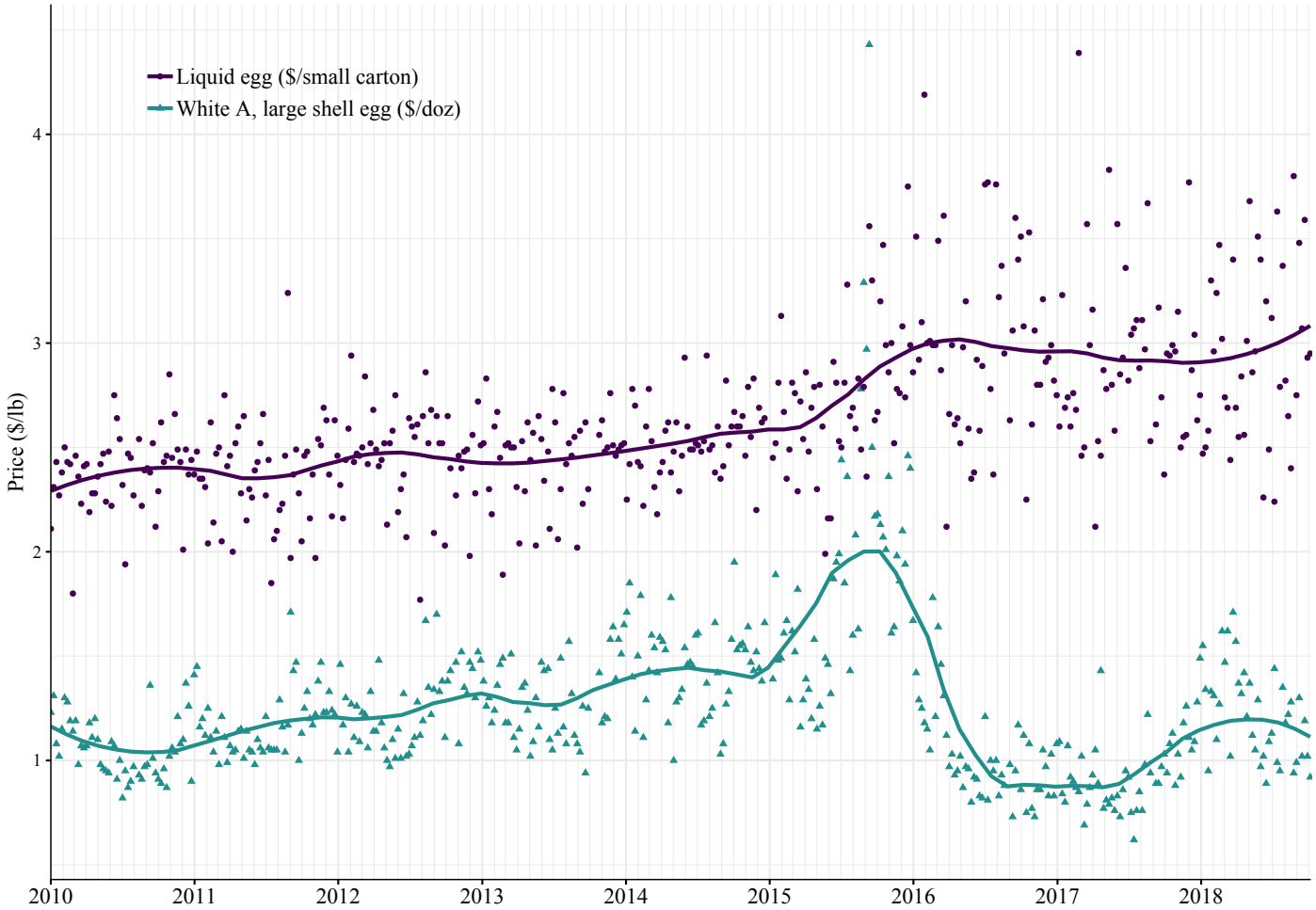


Wholesale chicken prices (Northeast United States)



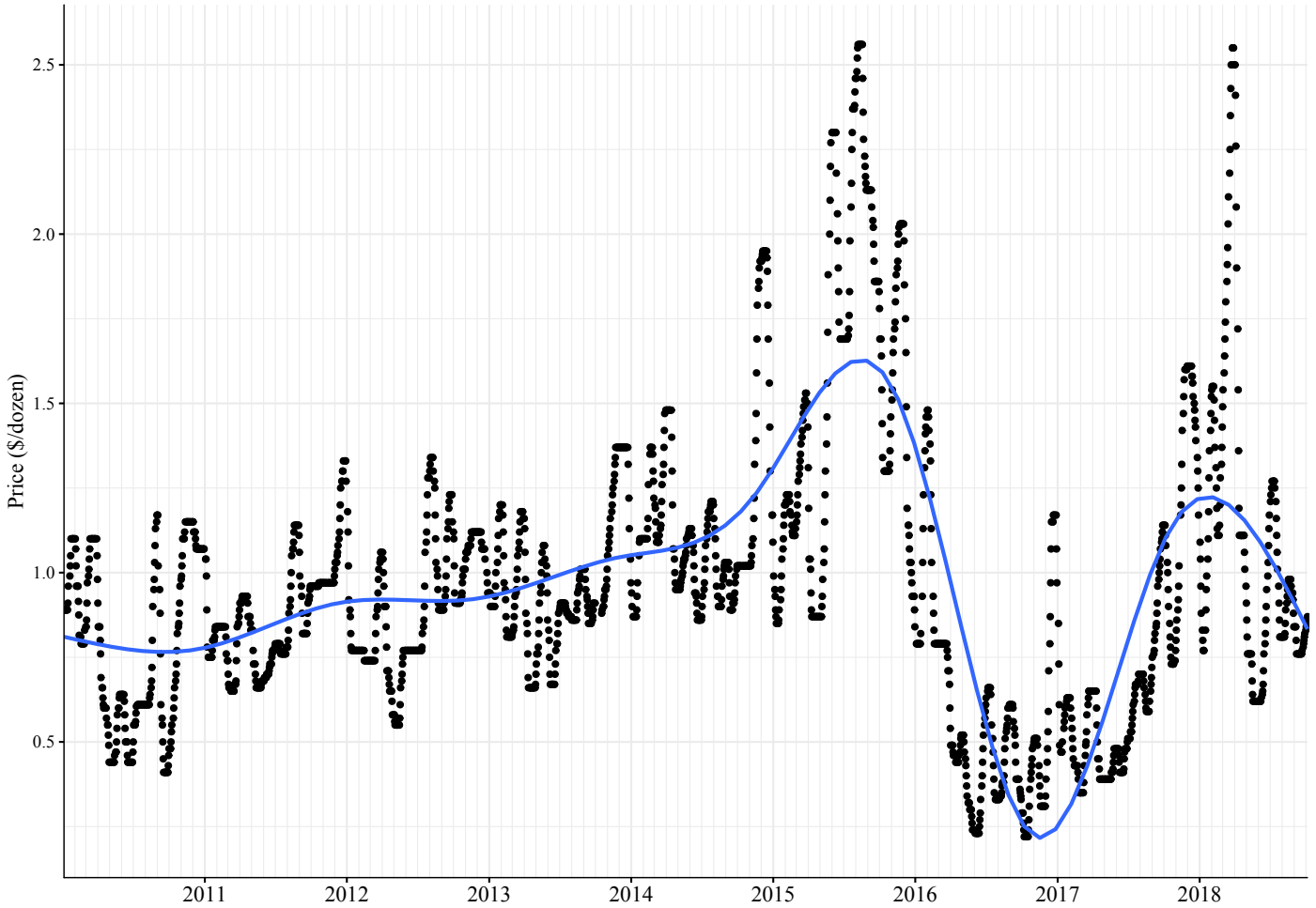
Data source: USDA - Agricultural Marketing Service (2018)

Retail egg prices



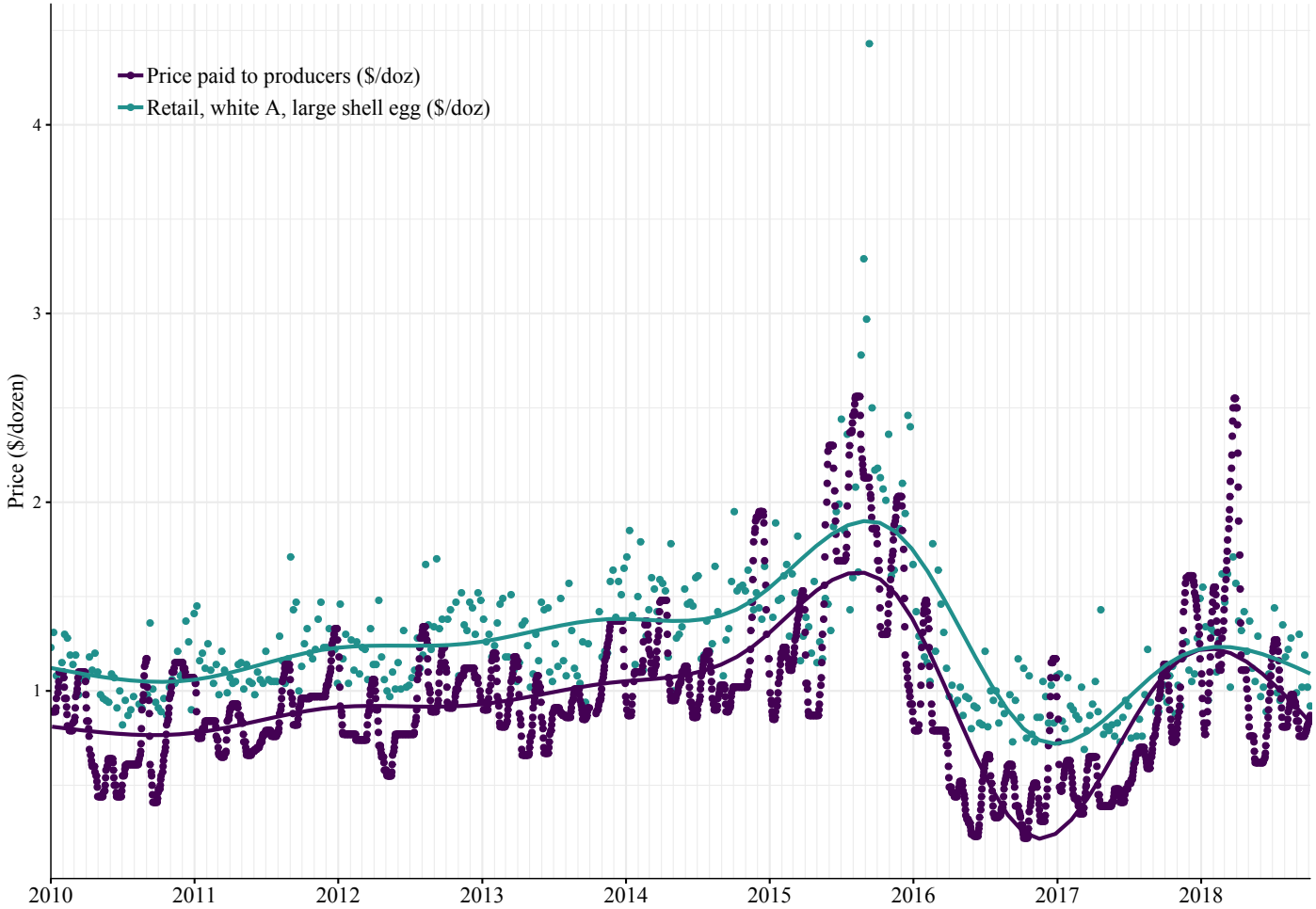
Data source: USDA - Agricultural Marketing Service (2018)

Wholesale egg prices



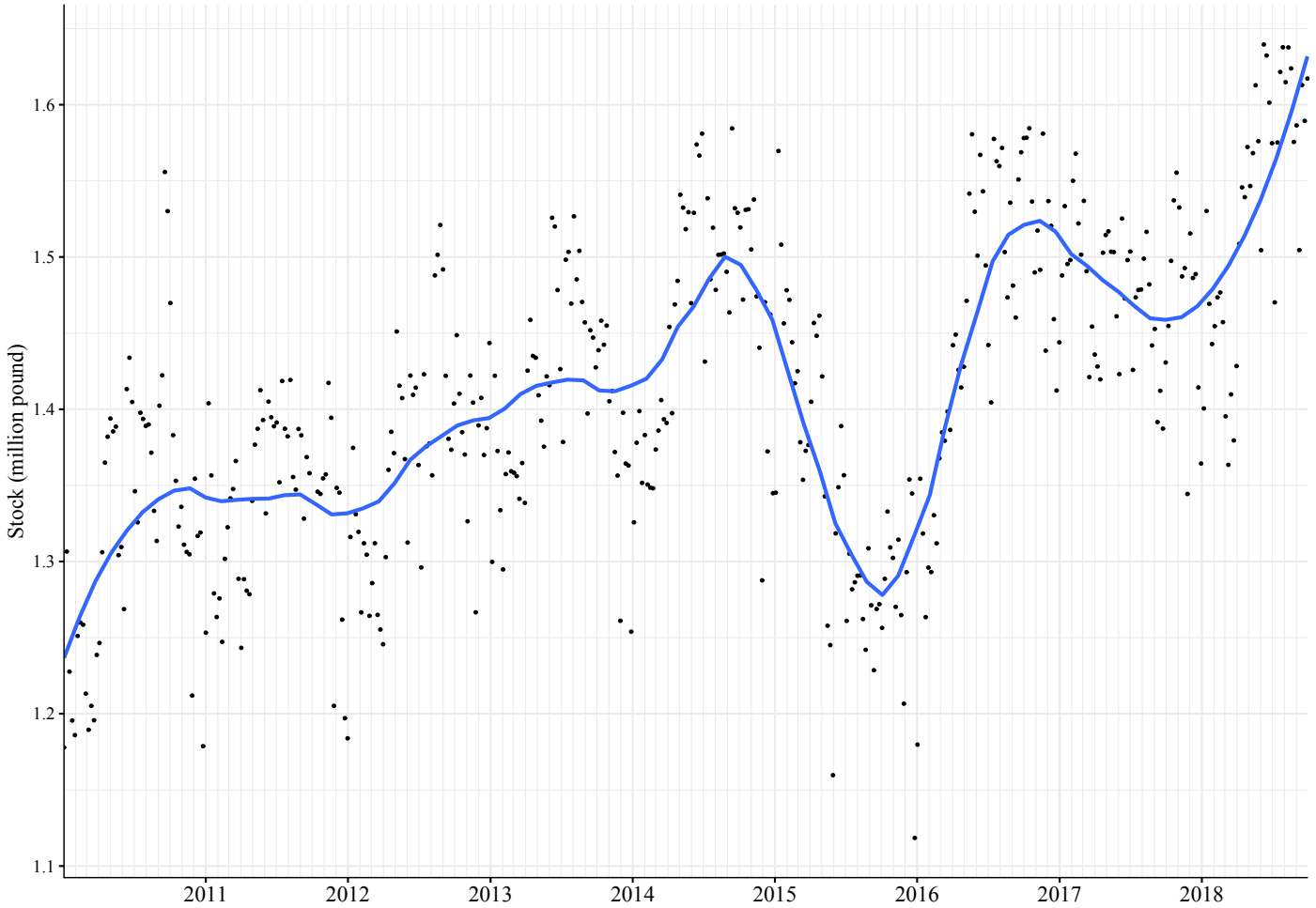
Data source: USDA - Agricultural Marketing Service (2018)

Retail and wholesale prices



Data source: USDA - Agricultural Marketing Service (2018)

Egg stocks

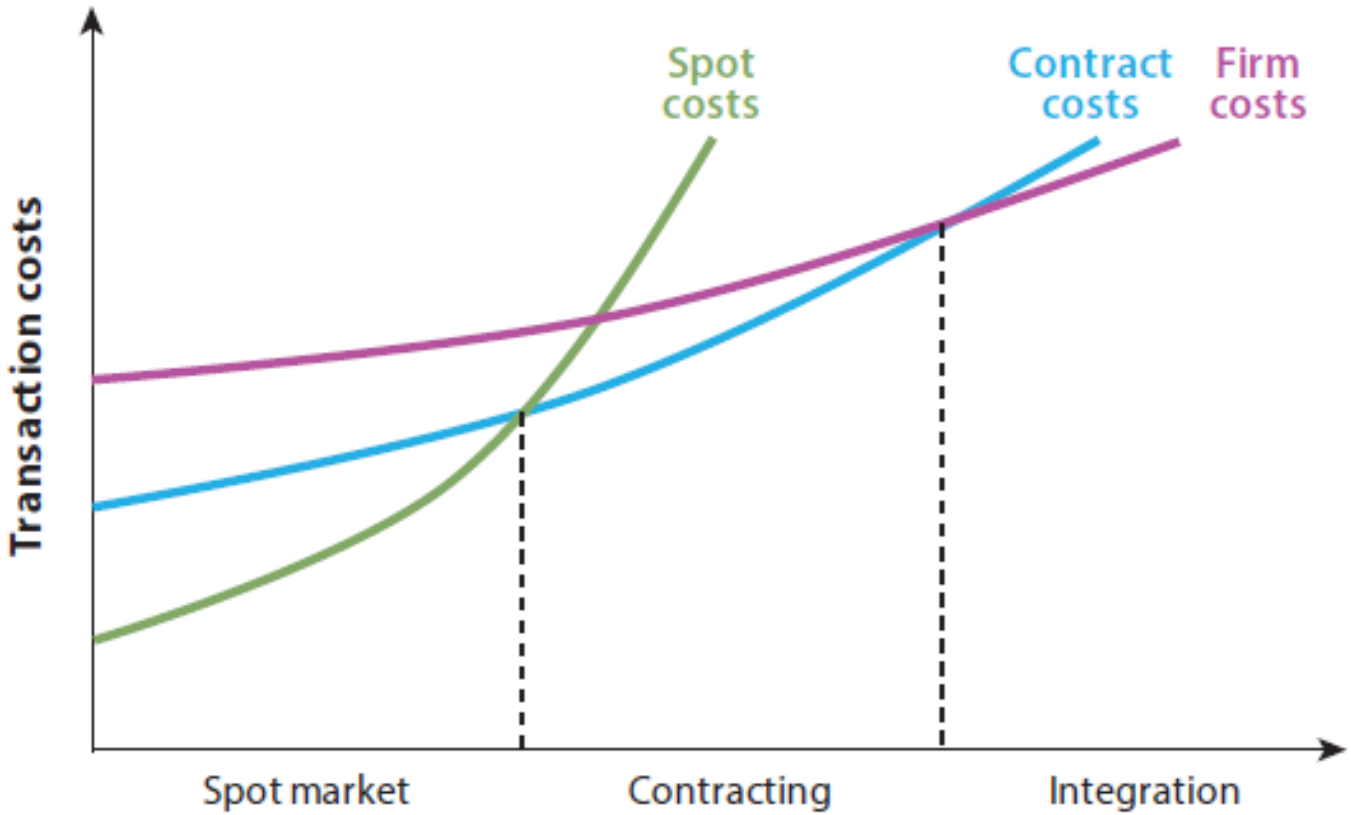


Data source: USDA - Agricultural Marketing Service (2018)

Vertical integration in the chicken industry

- Almost all chicken production is under some form of vertical integration.
- Almost all egg production is under full vertical integration.
  - In the table egg production, farms control the whole supply chain.
  - No need for contracts, except perhaps for feeds, as production is fully integrated.
- Remember that integration happens when it minimizes transaction costs, which increase with respect to asset specificity.
- Vertical integration in the poultry and egg industry allowed to improve genetics, grow birds uniform in size, remove seasonality and remove production cycles.

Transaction costs and asset specificity



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

Contracts for chicken production I

- See a description of production contract from the National Chicken Council.
- In a typical contract (some hog production contracts also work this way):
  - The integrator provides the chicks, the feed, veterinarian care and technical assistance.
  - The integrator remains the owner of the birds throughout.
  - The integrator delivers the chicks and later picks up the chicken.
  - 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.
  - The farmer must follow certain directive about how to care for the chicks.
- Payment for the services offered by the farmers uses a `tournament` system.
  - Calling it a tournament is not exactly correct but that is an expression commonly used.

Contracts for chicken production II

- To outsiders, it is difficult to know what these contracts specifically contain.
- The specifics of the contracts are private.
- The Farm Security and Rural Investment Act of 2002 allows farmers to discuss production contracts with certain people (e.g. federal and state agencies, lenders, accountants...)
- The structure of the contracts is similar across integrators.
- Integrators include provisions so they obtain the type of chicken they want.
- Payment is based on the relative performance of growers, hence the expression `tournament`.

Payment system in tournaments I

- Contracts specify the payment structure and integrators tend to use similar systems.
- The following describes an example of payment system for poultry but it works very similarly for eggs (and for hogs).
- The contracts specify a base pay for the services offered by a grower.
- The average cost of growing at a farm is then compared to the average cost of growing chicken for all farms delivering chicken during the same week.
  - The average cost per pound of growing chicken at a farm is calculated as the total cost divided by the total weight produced.
  - The costs are those from the inputs provided by the integrator;
  - They include the costs of chicks, feeds, medication, etc.
  - The average cost for all farms is the average cost over all farms delivering chicken during that week.
  - This is usually an olympic average where the growers with the highest costs (say 10% more or less than the average), are removed.

Payment system in tournaments II

- Growers who raised chicken at a lower cost than the average get a premium on top of their base pay, up to a maximum.
- Growers who raised chicken at a higher cost than the average get a penalty on their base pay, down to a minimum.
- Some contracts use a point system that determines premia and penalties based on growing costs.
- The contract specify how chicken are weighed and how to consider condemned birds.

Tournaments: controversies

- Economists typically like tournaments because they promote efficiency in a way similar to how competition promotes efficiency.
  - In pefect competition, in the short run, the most efficient firms make a profit and the least efficient firms make a loss.
  - The tournament system yields a similar outcome.
  - The tournament system gives an incentive to firms to operate efficiently.
- The most efficient growers love the tournament system because they make a lot of money from it.
- The least efficient growers hate it because it drives them out of business.
- NPR prepared an article on that issue.

Return to growing chickens

- Because production contracts are so prevalent, it is nearly impossible to know returns in farming chicken or eggs.

Advantages to vertical integration in the poultry industry I

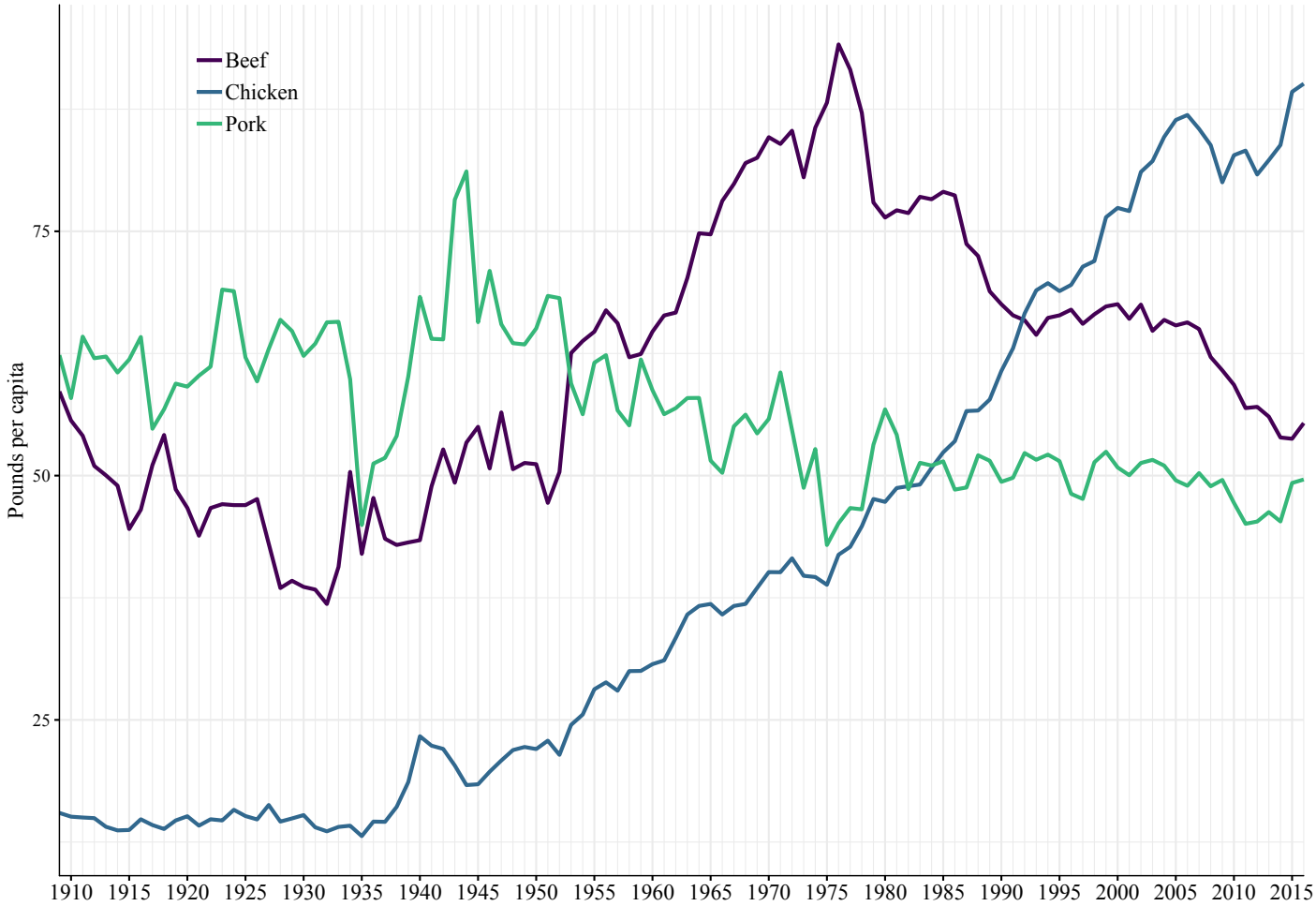
- There are some advantages to vertical integration in the chicken industry.
  - Smooths out production cycles, especially seasonal production cycles;
  - This allows to maintain a more uniform production volume throughout the year, reducing packing costs;
  - Reduces price risks;
  - Better control of genetics;
  - Allows for a better control of chicken characteristics (e.g. size), reducing packing costs;
  - Facilitates widespread adoption of latest practices and technologies, hence reducing production costs;
  - Secure a constant supply to packers, makes it easier to plan production.
- Vertical integration has contributed to reduce production and packing costs and to make poultry the most important source of protein in the United States:

Advantages to vertical integration in the poultry industry II

  - Per capita consumption of poultry exceeds per capita consumption for beef and for pork.

- Production contracts limit liability to integrator compared to them producing chicken and eggs.

Per capita consumption of red meat and chicken



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

Disadvantages to vertical integration in the poultry industry

- There are some disadvantages to vertical integration in the chicken industry.
  - Growers partly loose control of their operation;
  - Growers may have limited ability to negotiate the terms of production contracts;
  - Growers retain some of the production risk;
  - Not all contingencies are specified in the production contracts which may lead to litigation.

Vertical integration

- Remember that contracts are between parties that agree to their terms.
- Although there are some disadvantages, there must be enough advantages because many farms enter into these contracts.

References I

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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References II

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