

Livestock - hogs

Econ 235

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- The United States is the third largest producer of hogs in the world, behind China and the EU.
- The supply chain for hogs and pork operates differently than the supply chain for cattle and beef.
- Production cycles in hogs are shorter than in cattle but nonetheless matter.
- Like cattle, the characteristics of hogs are difficult to observe on a live animal and the market has come up with solutions.
- I will begin with definitions, then review some market data and finally turn to the economics of cattle marketing.

- [Information about livestock farming](#) from ISU extension.
- [Hog markets](#) from Mindy Mallory textbook.

Definitions

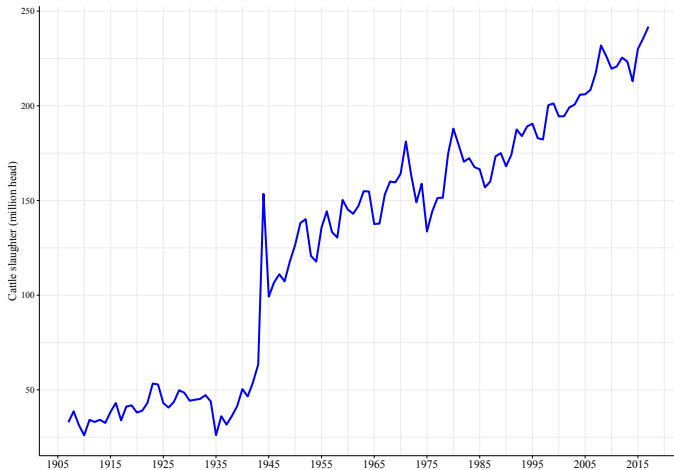
- Hog: Live animal;
- Pork: Meat from hogs;
- Barrow: Neutered male hog;
- Boar: Uneutered male hog, usually kept for breeding;
- Feeder pig: Young hog, 6-8 weeks old and 40-50lbs in weight;
- Gilt: Female hog that has not yet had a litter;
- Sow: Female hog that has had a litter;
- Market hog: Adult hog for slaughter;
- Piglet: Baby pig;
- Weanling: Weaned pig, typically 2-3 weeks old and 10-15lbs in weight;
- Farrow: Birth of piglets;
- Parity: Number of farrowings or litters from a sow.

- Farrow-to-finish: Production of hogs from birth (farrowing) to finishing (market hogs);
- Farrow-to-wean: Production of hogs from birth to weaning;
- Farrow-to-feeder: Production of hogs from farrow to feeder pigs;
- Wean-to-finish: Production of hogs from weaned pigs to finishing (market hogs);
- Feeder-to-finish: Female hog that has had a litter;

Supply chain (example)

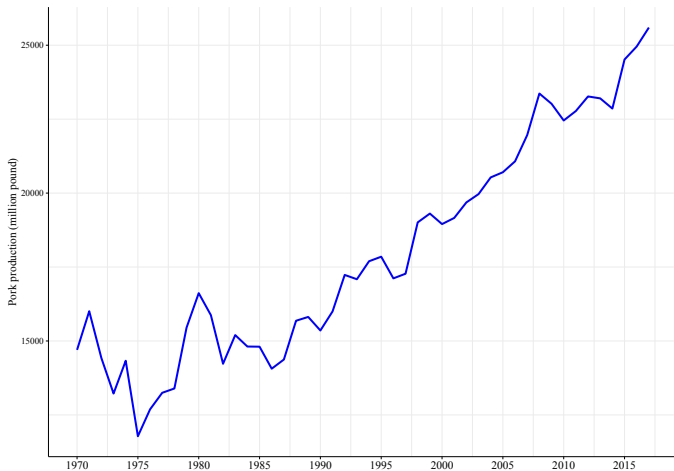
- Farrow-wean:
 - ▶ Sell weaned hogs (2-3 weeks old).
- Wean-to-finish:
 - ▶ Purchase weaned hogs;
 - ▶ Sell market hogs (24-29 weeks old depending on target weight).
- Packing/slaughter plant:
 - ▶ Buy market hogs;
 - ▶ Sell pork cuts.
- Retail/food service:
 - ▶ Buy pork cuts;
 - ▶ Sell beef to consumers.

Commercial hog slaughter



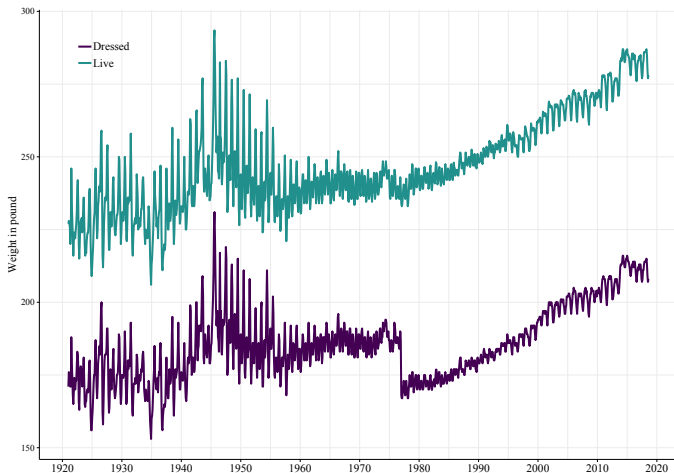
I suspect that the jump in the early 1940s is because of data recording. Source: [USDA - Economic Research Service \(2018b\)](#).

Pork production



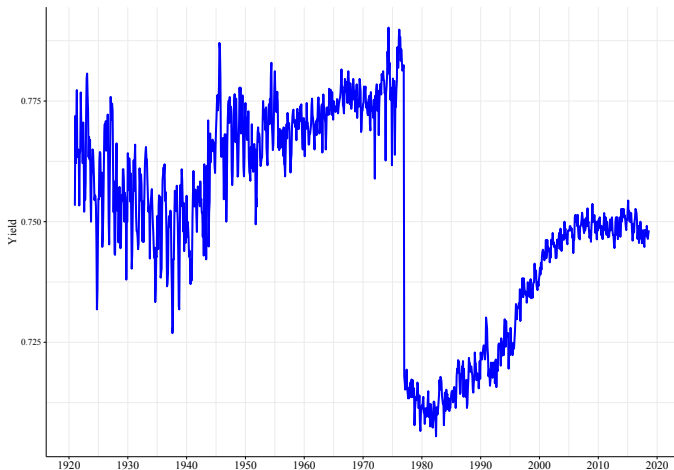
Source: [USDA - Economic Research Service \(2018b\)](#).

Average live and dressed cattle weight in federally inspected facility



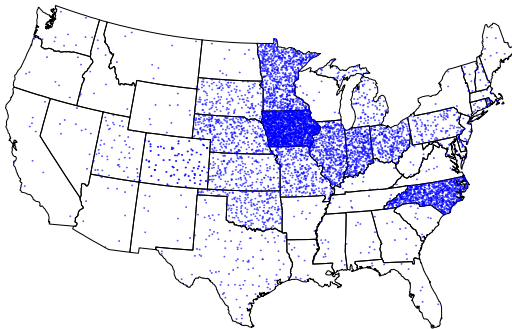
I suspect that the drop in carcass weight at the end of the 1970s is because of modification in the way to measure carcass weight. Source: [USDA - Economic Research Service \(2018b\)](#).

Average carcass yield (live weight/dressed weight)



I suspect that the drop in yield at the end of the 1970s is because of modification in the way to measure carcass weight. Source: [USDA - Economic Research Service \(2018b\)](#).

Hog inventory by state (March 1, 2018)



This is a density dot map. A dot does not represent the specific location of hogs. Rather, the number of dots within a state that represents the relative hog inventory by state. Source: [USDA - National Agricultural Statistics Service \(2018\)](#).

Hog inventory by state (March 1, 2018)

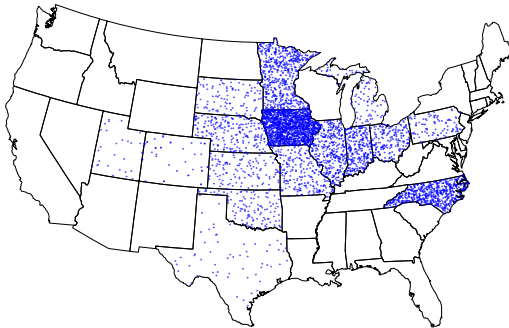
State	Inventory
Illinois	5.3
Indiana	4.0
Iowa	22.5
North Carolina	8.9
Other states	32.1

Note:

Inventory is measured in million heads

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

Market hogs by state (March 1, 2018)



This is a density dot map. A dot does not represent the specific location of hogs. Rather, the number of dots within a state that represents the relative number of market hogs by state.

Source: [USDA - National Agricultural Statistics Service \(2018\)](#).

Market hogs by state (March 1, 2018)

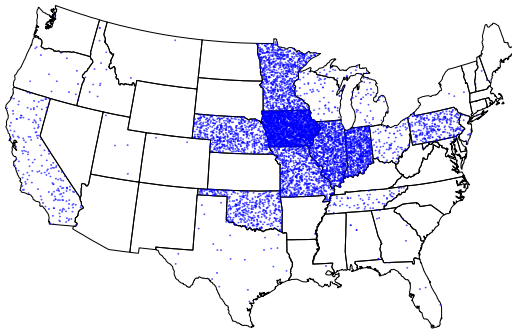
State	Market hogs
Illinois	14.4
Indiana	11.4
Iowa	65.6
North Carolina	24.5
Other states	78.4

Note:

The number of market hogs is measured in million heads

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

Hog slaughter by state (2017)



This is a density dot map. A dot does not represent the specific location of cattle. Rather, the number of dots within a state that represents the relative cattle slaughter by state. Source: [USDA - National Agricultural Statistics Service \(2018\)](#).

Hog slaughter by state (2017)

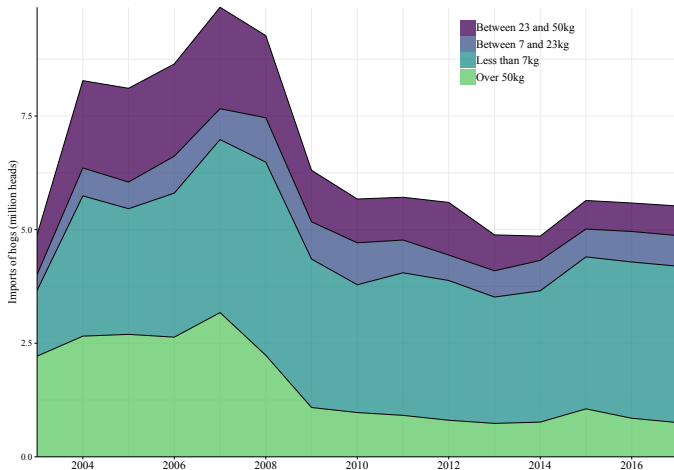
State	Market hogs
Illinois	12.2
Indiana	8.9
Iowa	32.9
Missouri	9.3
Other states	35.3

Note:

Hog slaughter is measured in million heads

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

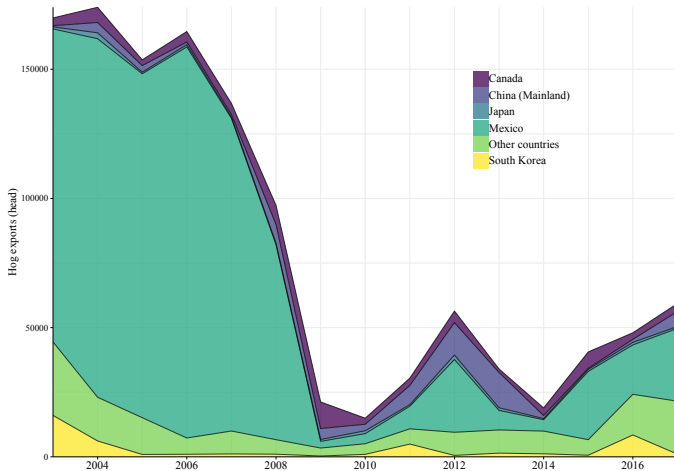
Annual imports of hogs



Source: [USDA - Economic Research Service \(2018c\)](#).

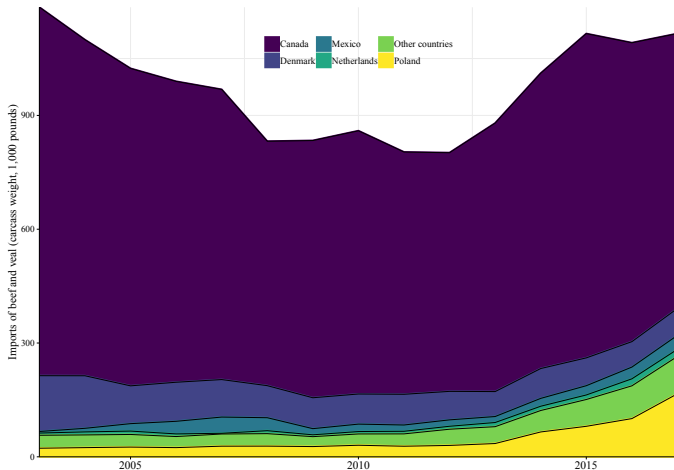
- Virtually all hog imports are from Canada.
- Most of the piglets (less than 7kg) come from Manitoba.
- Farrowing is more efficient (larger litter) in Canada presumable because of colder climate.

Annual exports of hogs (all weights)



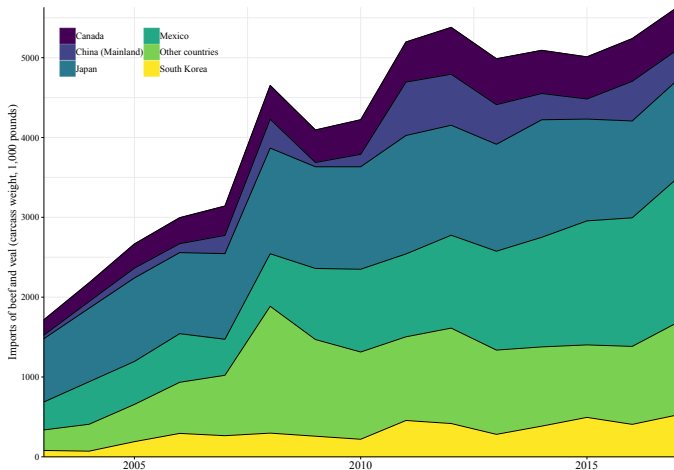
Source: [USDA - Economic Research Service \(2018c\)](#).

Pork imports (carcass weight, million pounds)



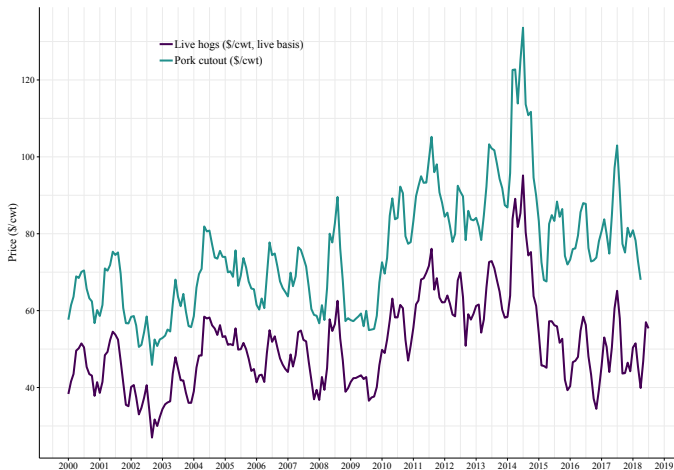
Source: [USDA - Economic Research Service \(2018b\)](#).

Pork exports (carcass weight, million pounds)



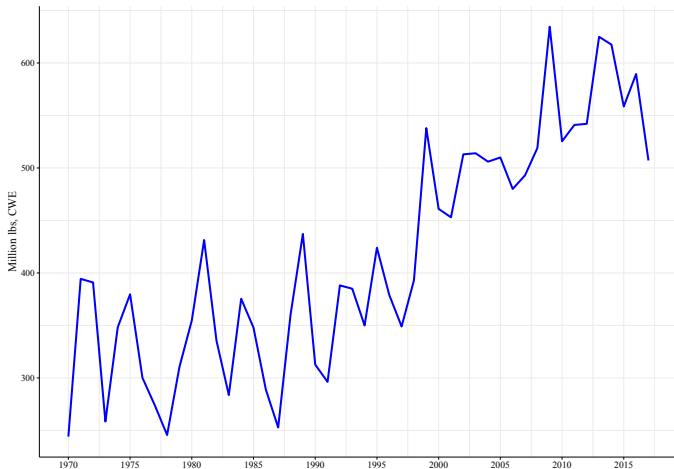
Source: [USDA - Economic Research Service \(2018b\)](#).

Live cattle price and boxed beef prices



Source: [USDA - Economic Research Service \(2018b\)](#).

Beginning stocks of pork (Million lbs, CWE)



CWE means Carcass Weight Equivalent. Source: [USDA - Economic Research Service \(2018b\)](#).

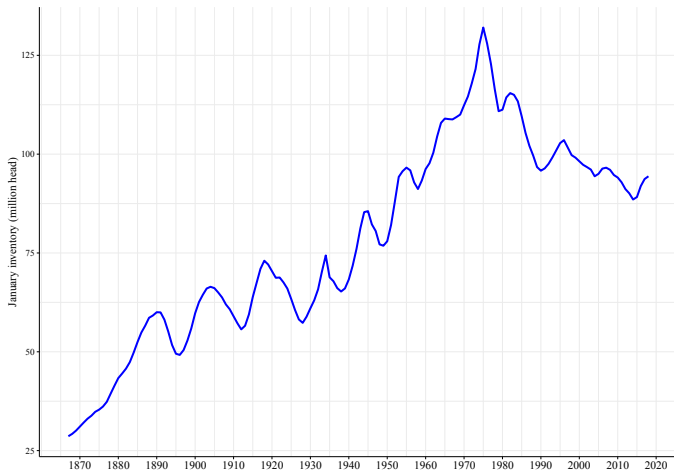
- Cattle cycles are expansion and contraction of cattle inventories at regular intervals (see cattle inventory figure above).
- A cycle lasts on average about ten years.
- Cycles occur because of biological nature of cattle production:
 - ▶ A heifer can be bred for the first time at about 15 months.
 - ▶ A heifer will have its first calf about nine months later.
 - ▶ It takes between 18 and 24 months between birth and slaughter.

Cattle cycles

- Biological lags cause a delayed response between an increase in the price and an increase in production.
 - ▶ If the price of feeder cattle increase, cow-calf producers increase the size of their breeding herd.
 - ▶ During the time it takes to increase the breeding herd, the price continues to increase because fewer cattle are sent to slaughter.
 - ▶ It takes at least three and a half years from the time a cow-calf operation decides to expand and the time its production actually expands.
 - ▶ Expansion continues until the prices for feeder cattle, fed cattle and beef begins declining from the increased production.
 - ▶ Cows are productive for about 10 years and producers usually do not cull cows that are still productive.
 - ▶ Cow-calf producers reduce the size of their herd by not replacing all of their old cows.
 - ▶ Beef cattle then declines and prices start increasing once again, re-starting the cycle.
- Cycles last about ten years because it is the age that most cows are culled.

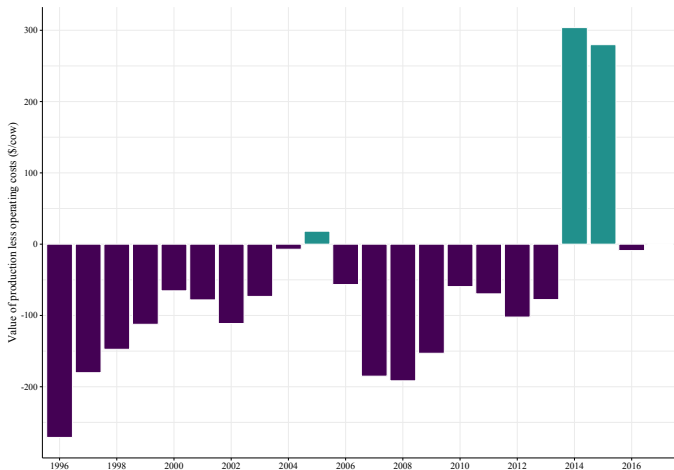
- Cycles contribute to periods of prosperity followed by periods of losses to cattle farmers.
- See for example historical returns in the cattle sector at <https://agmanager.info/livestock-meat/cattle-finishing-historical-and-projected-returns> or at <https://www.ers.usda.gov/data-products/commodity-costs-and-returns/commodity-costs-and-returns/>

US January cattle inventory (including calves)



Source: [USDA - National Agricultural Statistics Service \(2018\)](#).

Return to a cow-calf operation in the Heartland



Source: [USDA - Economic Research Service \(2018a\)](#).

- It is possible to use different methods to sell feeder cattle and fed cattle.
- Quality must be observed or controlled for in the pricing method through contract arrangement.
- Each method has its advantages and disadvantages.
- Underneath all selling method, the futures market helps with price discovery.

Selling methods: public markets

- Public markets include terminal markets and auction markets.
- Both fed and feeder cattle are sold in public markets.
- Terminal markets:
 - ▶ Almost no longer existent;
 - ▶ Terminals were located near railways;
 - ▶ Cattle are brought into stockyards;
 - ▶ Sale occurs through a commission agent;
 - ▶ Seller receives the sale price minus charges for the stockyard and the agent.

- Auction markets:

- ▶ Common sale method with many auction facilities;
- ▶ Cattle are brought to an auction facility;
- ▶ Cattle sold by public/competitive bidding;
- ▶ No commission agent is involved;
- ▶ Auction can occur live or electronically (video);
- ▶ Buyer receives the price minus a fixed or percentage charge.

Selling methods: direct sales

- In direct sales producers sell directly to downstream buyers.
- Both fed and feeder cattle are sold in direct sales.
- Seller is more involved in the sale of cattle.
- No need to move cattle to an intermediate location.
- Can build long run relationship.
- Predetermined pricing method (see below).

Selling methods: hybrid markets

- Growing marketing method.
- Cattle are videoed at the farm.
- Bidding and sales occur through electronic auctions.
- No need to move cattle to an intermediate location.
- More difficult to observe quality.

- The price of feeder cattle is determined at the intersection of demand and supply.
- Costs of cow-calf and stocker operations affect the supply of feeder cattle.
- Many factors affect the demand for feeder cattle:
 - ▶ Feeding costs at feedlots (e.g. cost and other feeds);
 - ▶ 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 feeder cattle (e.g. breed, weight, color) explain difference in prices across cattle.

- The price of fed cattle is determined at the intersection of demand and supply.
- Costs of feedlots affect the supply of fed cattle:
 - ▶ Includes the cost of feeder cattle;
 - ▶ Cost of feed (e.g. corn);
- Many factors affect the demand for fed cattle:
 - ▶ 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 feeder cattle (e.g. breed, weight, color) explain difference in prices across cattle.

- Throughout the supply chain, the characteristics of cattle will affect their prices.
- Quality is difficult to observe for cattle but plays a big role in pricing cattle.
- Characteristics of cattle matter because the quality of the beef output depends on those characteristics.
- Some characteristics that affect beef quality include
 - ▶ Breed;
 - ▶ Sex;
 - ▶ Age;
 - ▶ Weight.

Pricing fed cattle in direct sales

- Visual inspection of a live cattle can give an idea of meat quality but is not always accurate.
- Direct sales can include provisions to take into account the quality of the beef output.
- The final price is not determined at the sale of live cattle but rather after grading of the carcass.
- Three options possible:
 - ① Live weight pricing;
 - ② Carcass or dressed weight pricing considers carcass weight;
 - ③ Dressed weight and grade or grade and yield pricing considers both the yield and quality of the meat.
- Sales other than direct sales are live weight.

① Live weight:

- ▶ Only considers live weight (on the hoof);
- ▶ Price negotiated before delivery;
- ▶ Weighing conditions matter;
- ▶ Potential yield and quality are estimated by observing live cattle;
- ▶ Seller does not have to wait for grading before knowing the final price;
- ▶ Buyer (packer) assumes yield and quality risk (discount compared to other selling methods?).

② Carcass weight

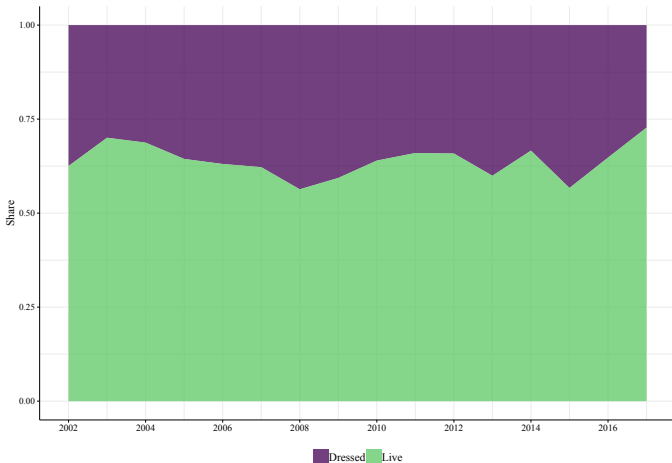
- ▶ The price is based on carcass weight;
- ▶ Price negotiated before delivery;
- ▶ Seller assumes yield risk;
- ▶ Buyer (packer) assumes quality risk.

③ Dressed weight and grade

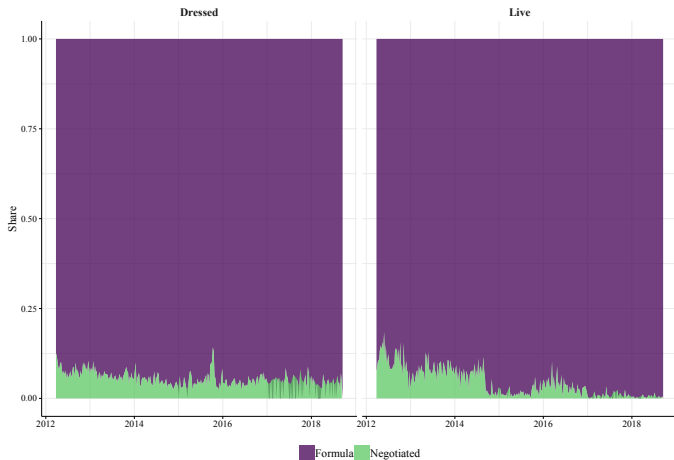
- ▶ The price is based on carcass weight and quality;
- ▶ Each carcass is evaluated and priced individually;
- ▶ Premia and discounts are negotiated before delivery;
- ▶ Base price is either negotiated or based on a formula;
 - ★ Formula pricing can set the base price considering the average cattle price in the prior week, market reports, boxed beef cutout value, futures market prices or negotiated prices.
- ▶ Seller assumes yield and quality risk;
- ▶ Buyer (packer) assumes quality risk.

5 area markets - live versus dressed weight

- The 5 markets are 1) Texas & Oklahoma, 2) Kansas, 3) Nebraska, 4) Colorado and 5) Iowa & Minnesota.



5 area markets - direct sales - negotiated versus formula



Carcass grading

- Carcass are graded based on the expected quality of beef and meat yield.
- This is a voluntary service offered by the USDA for which processors pay.
- It is different than inspection for wholesomeness which is mandatory and paid from public fund.
 - ▶ If a plant does not follow the proper mandated food safety practices an inspector can shut down a plant until it demonstrates compliance.
- See definitions of yield and grades at this link:
<https://www.ams.usda.gov/grades-standards/carcass-beef-grades-and-standards>.

- A higher yield carcass produces more meat to sell at retail.
- ① YG 1: carcass has the highest expected yield of retail cuts.
- ② YG 2:
- ③ YG 3:
- ④ YG 4:
- ⑤ YG 5: carcass has the lowest expected yield of retail cuts.

Quality grades

- Higher quality means tastier beef.
- ① Prime: highest quality, has the most marbling.
- ② Choice:
- ③ Select:
- ④ Standard: Lowest quality, least amount of marbling.
- ⑤ Commercial: Older cattle.
- ⑥ Utility:
- ⑦ Cutter:
- ⑧ Canner: My dog would still love it.

Mandatory price reporting (MPR)

- Negotiated prices have become much less common.
- Congress passed a law in 1999 to address concern about lack of public disclosure of transaction prices.
- Price discovery becomes difficult if there is no public data about prices.
- Secrecy also favors abuse of market power, which is a real concern in a concentrated market such as beef packing.
- See rulemaking for MPR at [USDA - Agricultural Marketing Service \(2018\)](#).
- [Jr. et al. \(2015\)](#) shows the impact of MPR on markets.
- MPR data are available at <https://mpr.datamart.ams.usda.gov/>.

- Jr., K. H. M., Brorsen, W., Hahn, W. F., Arnade, C., and Dohlman, E. (2015). Mandatory price reporting, market efficiency, and price discovery in livestock markets. Technical report, USDA Economic Research Service.
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