

## [Webinar Transcript – Concentration and Competition in U.S. Agribusiness](#)

Good afternoon, everyone. My name is Ashley Murdie - your host for today's webinar. On behalf of USDA's Economic Research Service, welcome and thank you for joining us. Today, we're spotlighting an ERS report on Concentration and Competition in U.S. Agribusiness. Market concentration and its impact on competition has attracted growing public scrutiny. Critics argue that many industries have grown too concentrated with fewer firms competing with one another and a consequent weakening of competition. The issues surrounding concentration extend to agribusiness, particularly the three agribusiness sectors where concentration has increased over time: seeds, meat packing, and food retail. Today, James MacDonald, an economist with our Resource and Rural Economics Division has joined us to present findings from the report and answer questions from the audience alongside his co-authors: Keith Fuglie and Xiao Dong. Now before we begin, I'd like to quickly note that this webinar is being recorded and will be posted on the ERS website next week. If at any time during the webinar you have questions, please enter them into the chat feature at the bottom left-hand corner of the screen and our speakers will answer those at the end of today's presentation. Again, thank you all for joining us. James, the floor is yours.

Thank you, Ashley, and welcome to the audience to our presentation. Let's get right underway. Industry concentration is a topic that's attracted widespread interest. Let me start with what we mean by it. When we refer to high concentration what we mean is that a few companies, one or two or three, supply most of a market. When we have high concentration that does raise concerns about whether those firms can exercise market power to raise the prices that they charge to consumers or to lower prices that they pay to suppliers in each case compared to what we would see in a competitive market. Now, we've seen increased concentration in many sectors of the economy. The big question is: does that imply that reduced competition? In recent years there's been widespread media and academic discussion of just these issues, as well as a number of policy initiatives. At the beginning of the Biden Administration the White House issued an Executive Order on competition that was quite extensive with quite a few impacts on federal agencies.

Now, these concerns extend the agribusiness. Now our report, as Ashley mentioned, focuses on three sectors of agribusiness: crop seeds, meat packing, and food retailing. Why do we pick these three? Well first, they're actually, they're large. They're important parts of the food system. Each one of them has seen striking transformations in how those industries are organized over the last several decades. And as part of that transformation, we've seen substantial increases in concentration in those industries. And in each one, competition policy and, in particular, the part of competition policy that deals with merger policy has mattered. So, what we're trying to do in this report is for each sector, we're going to try to explain how and why each of these sectors became concentrated. And we're going to discuss the role of public policy, especially antitrust and particularly merger policy, and how those industries were transformed and, in some cases, how mergers were opposed under the antitrust laws. We're going to talk about each of those things as we go along.

Now, competition issues in these sectors actually differ across them. In crop feeds, for example, there's a great deal of research and innovation taking place and the question here becomes: as concentration is increased, does high concentration spur more research and innovation, or does it actually deter it? That's become an important issue in recent merger case. In meat packing, by contrast, plants and meat packing have gotten much, much larger. And at the same time, and related to that, packers have altered the way they acquire live animals. They rely much more on contracting with farmers and much less on the use of spot markets. Do these changes in the industry, including higher concentration, do they facilitate lower costs for processing? Or do they facilitate exercise and market power and lower prices for farmers. That's the issues that arise in market and meat packing. In food retail we've seen striking changes in several decades in the form of new types of entrants and new store formats emerging. So, we now have much more-much more competition among nationally based chains than we used to face. However, competition occurs really in local areas and the question here is: when does high concentration in local market areas lead to increased prices compared to what we would see in a competitive market?

Now, what I'm going to do in the next several charts is just give you a little bit of background for each of these sectors on concentration and what we mean when we're talking about high and growing concentration in those industries. Let me start here with seeds. And what the chart shows is the share of acres planted in three different major crops: corn, soybeans, and cotton. And it's the share of acres planted to seed bought from different companies. The blue being Bayer, the orange being Corteva and then we also see Syngenta, BASF, and others. And what jumps out at this is that in corn, for example, well over 75 percent of acreage and corn is held by two companies, two seed sellers: Corteva and Bayer. Corteva and Bayer also hold very high shares of soybeans and quite high, well over half, of cotton. So, two companies dominate the market and those come on in those crops, and most acreage in those crops, 95 percent of acres, is genetically modified seeds. There, the firms have developed and sell genetically modified seeds. These are seeds that have been modified for two types of traits. One is insect resistance, so the seed itself carries an insecticide, and the other is herbicide tolerance and so the seed itself is tolerant, won't die when you spray the general-purpose herbicide on it, while that herbicide kills the weed. Those are the two major GM traits that have been developed over the years. Now, concentration in those traits themselves is even higher. In some markets it's just Bayer and Corteva for selling the traits rather than the seeds that the traits are incorporated, or bred, into. Now, we also point out that seed markets for non-genetically modified crops, that is other field crops from vegetables, are often highly concentrated with two to four companies dominating each market. So, in many seed markets we have a rather small number of firms selling most seeds - those markets are highly concentrated.

Let me talk a little bit about meat packing now. Chart on the right - slightly different structure. It shows for four different types of livestock, that is: steers and heifers, hogs, broilers, and turkeys. It shows in each of four years the share of animals procured by the four largest firms, right? So, the share of all steers and heifers purchased by the four largest packers that are buying steers and heifers. Same thing for the other animals. Now what we show here, to start with steers and heifers, is a dramatic change during the 80s and 90s. The gold bar shows concentration in 1980.

So about 35 percent of all steers and heifers were acquired by the four biggest packers in that year. Fifteen years later, by 1995, it was 80 percent. So that's, you can see in that chart that dramatic increase. I know no mature industry that had such a dramatic change in concentration in a shorter period of time. And that, itself, led to a great deal of research and policy discussion over the last 30 years. Now, in that chart you can also see a substantial increase, less rapid than in steers and heifers, but a substantial increase over somewhat longer period of time in hogs. Meanwhile broilers and turkey show relatively little change in concentration over time. So, next to the last point I want to make while we're on this slide is these are national measures. They're measures nationally of the total sphere of steers and heifers, for example, bought by the four largest packers but most competition for ranchers for live animals occurs in local and regional markets. That is if you're raising cattle in Colorado, you don't really care that there's a packing plant in Ohio. You're not going to ship your cattle that far. Live animals are simply not shipped that far for a variety of reasons. In most local markets where you're actually selling animals concentration is considerably higher. Typically, one to three buyers for any of these animals in local markets. So, local markets tend to be quite highly concentrated.

Alright, next...Growing concentration in food retail. This is a different measure I'm using in this chart. I'll just tell you that higher numbers correspond to fewer producers and therefore higher concentration. The light blue line at the bottom of this chart measures concentration in grocery sales across all chains in America. You can see it's increasing over time. It starts at a relatively low value, you can see close to zero there, the number that is there for 1990 would be equivalent to having 50 different chains of all the same size selling groceries. That concentration has increased over time so that by the last year's shown, 2019, that concentration number would be equivalent to having about 20 equally sized supermarket chains across the country. Now, that's still a lot of firms. There's been a dramatic transformation nationally so that we have far fewer firms, but nationally there's still quite a few. What the chart also shows though is measurement in different local areas because once again competition in food retailing occurs within local areas. So, the red line shows average concentration at the state level, we measure concentration within each state and then we take the average across states. What that line shows you is more concentrated, on average, within states than within the United States and concentration growing over time. The very top line, the solid blue, is measured at the county level. We take concentration in each county and the chart shows the average across counties. And what we see is that rising pretty sharply over time. And at the county level, what we see is more like two to three to five competing chains in a county, rather than 20 and 30 nationally. So, concentration markets are much more concentrated locally, and at every level of geography that measure of concentration has been increasing.

All right, so those are the basic facts we want to give you about concentration. What I'd like to do now is shift over and spend a few slides on each sector talking about how they got concentrated. We'll start with seed market concentration. The driving force here was the expansion of intellectual property rights in seed and in genetically modified traits. It came about through a series of Supreme Court and Congressional actions in the late 70s and extending into the 1990s that provided greater intellectual property protection and therefore greater assurance of a return if you invested in seeds and in biotech traits. As a result, that stimulated a great deal of

private investment in crop breeding and in biotech. Now I mentioned earlier, when you develop a GM trait you have to breed it into existing seeds, which themselves have many other traits that have been conventionally developed. So, if you're going to develop GM or biotech traits, you also need skills in that conventional breeding of seeds. And you need access to that what's called germplasm to breed traits into. In addition, if you're developing these traits, they tend to be used primarily to fight pests and they can substitute for or complement agricultural chemicals. As a result, there's a great deal of complementarity in both technology development and in marketing among the development trait, development and chemicals. And so, these major firms acquired other producers in each of those areas and developed programs that covered all of those different, but complementary, technology areas. That was an important force in driving concentration in the industry.

Alright, well let's get straight down to some of the competition issues that arise here. In this chart, we're showing trends in prices for crops and for seeds since 1990 and compared to each of their levels in 1990. So, these are what we call index numbers. And what you can see the lowest line is the USDA's average crop price. You can see it rising through time. Above that are three lines for seed prices. First, non-genetically modified seeds, then second with the markers, the average across all seeds, and the top is genetically modified seeds. And what you can see is those prices have risen much more rapidly than crop prices through time. And so, as a result the share of producer costs taken up by seeds has risen quite a bit. And we can see GM seed prices have risen faster than other seed prices. However, what we want to keep in mind is those higher prices might reflect higher quality and productivity of the seed varieties and traits developed through these prices may reflect quality and productivity improvements in the seeds that becomes the big kind of trade-off.

As we can see here, on the left chart. We track company sales and company spending on R&D. And these firms consistently spend about 10 percent of their sales on R&D, on research and development. That's a big number. Those are highly research-intensive companies and markets. On the right-hand side, we show an indication of innovation that is the number in different years of different types of patents and other types of intellectual property, and we can see that's increasing sharply over time. So that investment has led to more patenting and more speed and seed variety innovations.

Now, this comes to a head in the big merger cases and starting around 2015. In that period, there were proposed mergers among the major global seed and chemical producers. That is Bayer proposed to purchase Monsanto. Dupont and Dow merge to form Corteva, and ChemChina acquired Syngenta, another major seed company. Now, the U.S. antitrust laws, particularly with regard to mergers, prohibit those mergers that reduce competition. So, in this case, the antitrust reviews are aimed at these proposed mergers and trying to evaluate their likely impact on prices. One indication of competition with the question being: are they going to be able to raise seed prices because of the merger? And secondly, the question was: will this affect research and innovation? In particular, in many specific seed and trade markets we're going to see changes in the number of competitors from say three to two or two to one. In that case, in a highly concentrated industry the question becomes: would we expect mergers to reduce the incentive to

spend on research and innovate? That became the key competitive question. In this case, after reviews in both the United States and the European Union, but also in Brazil, India, and South Africa as well, uh the reviews led to divestitures of company assets and mergers where it was clear in markets where it was clear that merger would reduce competition. In particular in those markets where a merger would reduce the number of sellers from three to two, or two to one. So, as a result, a Bayer Monsanto merger was approved, but under the condition that Bayer sell off a significant amount of its seed business to another company, to BASF. The DuPont Dow merger was approved but on the ground on the condition that Dupont divest, sell off a significant part of its pesticide business to another firm. So, there's an indication of how merger policy works in that significant set of mergers.

Alright, let me shift a little bit and talk about meat packing concentration. In this case, remember concentration in steers and heifers rose dramatically in the 80s and early 90s. In that case, what happened was packers built much larger plants. They realized that they could obtain or realized scale economies lower costs of processing with a much larger plant, and so they built much larger plants. Now in beef, beef consumption in the United States - per capita beef consumption has actually been declining in that period. So, as a result the beef industry was growing very slowly. In that case, if you are going to build much bigger plants the impact - with essentially no change in cattle slaughter and beef production - would be it's smaller and mid-sized plants were going to get forced out by those large, low-cost plants. And that's what happened. So, that is a driving force in that dramatic increase in concentration we saw in beef. On the other hand, in poultry we've had continuing rapid growth over the years. In consumption of chicken and even turkey. As a result, that construction of bigger plants was accommodated by the growth and demand, and we saw a little change in concentration in those markets. Now, another aspect of that change, though, is that that realization of scale economies in larger plants is only going to happen if you can assure that you're going to get a steady flow of animals coming into those plants. So, as a result, packers changed the way they acquired animals. Almost all poultry and hogs today are acquired via production contracts in which growers contract with packers to raise the animals on their behalf. We have a different type of contracting arrangement that still dominates most flows of cattle - that is most of those are acquired through marketing contracts with feedlots.

As a result of all this, there's really three types of concentration concerns in meat packing. First there are markets for the purchase of livestock, some hogs and still most cattle. Questions there are does concentration allow packers to impose lower prices for the animals because they're concentrated? But secondly, there are many markets now, part of hogs and almost all poultry, in which what's going on is that processors are hiring people - farmers to raise the animals for them. So, these are much more like the labor market - markets for the hire of contract growers. The question there becomes: in more concentrated markets, are you able to pay your growers less, lower fees in this type of labor market? And then finally, there are issues that arise in those output markets. That is markets for the sale of meat product, products whether it's chicken parts or beef roasts. So, three different types of markets um in meat and livestock industries. Each one does face some competition issues in slightly different ways.

Let me get to a little bit of evidence. As I said we've had a lot of research over the years particularly on cattle and beef. I'll just touch on that here. The report covers quite a bit more. One of the striking things we learned in studies done before about 2010, was that even though the industry had become much more concentrated, one found only limited evidence of market power, and that's indicative in the chart we see here. This chart tracks a USDA ERS monthly price series. That price series tracks the difference between the price that packers receive for wholesale beef and the price that they pay for cattle. So, it's the, what's called the Choice Beef Price Spread. And what we see in that is a lot of month-to-month fluctuations, but in the period going from around 1990 to around 2016, you really see no trend at all in that spread. If packers were exercising a lot of market power, we should have seen that spread increasing, widening because the spread actually captures costs plus profits. But notice what happens after about 2016, we see a very sharp trend increase in that spread that had not been there before. Now there's a lot going on. There was a big fire one summer. There was COVID. Some of those things are giving you these really striking short month-to-month fluctuations, but we still see this powerful trend. And there's a good reason to ask whether that trend indicates the exercise of market power in those industries - in meat packing would be particular - that we did not see in the period of sharp increases in concentration.

Okay, one more thing about beef high price spreads economists believe should attract new entrants into more into meat packing. And in fact, that's what we're seeing. The chart here shows recent entrance into broilers, hogs and cattle production. Entries both an indication of high profits - perhaps for market power and money to be made. It's also (once it gets carried out) an antidote to market power and high profits and money to be made as that entry, its capacity, drives up prices for livestock, drives down prices for uh meat. There are two interesting features to this table I'll just quickly point out right now. One is all of the entrants listed here are associated with organizations of livestock producers or food retailers. So, for example at the top, Lincoln Premium Poultry is associated with Costco, a major retailer entering into boiler production on behalf of that retailer. The others in hogs and cattle will represent organizations of producers vertically integrating into packers. That's a new change and an interesting change. The other thing I'll just finally, I'll point out on that chart is I've listed the size of these plants. In cattle you can see 500 head per day, up to 1,500 head per day. A large modern plant handles about 5,000 head per day. So, one question looking ahead is: will these smaller entrant plants be able to compete with the large existing current plants? That is an open question for how competition is going to work out, but I should say this is a striking development. We have not seen this kind of entry in the industry in quite a long time.

Alright, briefly merger policy in meat packing. I'll just assert in the article and we spend a lot more time on it in the report, mergers mattered little to that big increase in concentration that we saw in the 80s / 90s. They came about (that increasing concentration came about) because packers built bigger plants. We have later had mergers after it got concentrated and merger reviews. In some cases, mergers had no effect on concentration, and they were allowed to go ahead. I give the example of JBS - a Brazilian firm acquired Swift at a time when JBS had no cattle or hog plants. So that acquisition would have no effect on concentration. That went ahead. The antitrust authorities blocked a later attempted acquisition by JBS/Swift (at the time, the

number three packer) to acquire National Beef (at the time, the number four packer). That would have increased concentration, and, and we go through the thinking and the theory of how those types of decisions work um in the report.

Okay, let me take a little bit of time now to talk about the transformation of the food retail landscape. Two big types of things going on...First, is the growth of non-traditional food stores - places like Walmart, Target, Costco that added, in the case of Walmart and Target Supercenters - that is very large discount department stores that sell lots of stuff: toys / apparel, but also sell a lot of food. And then places like Costco that manage what we call warehouse club stores here - limited general merchandise stores that might sell large sizes of packaged food products that don't give you a lot of service. You go and pick the things out for yourself. These have become major important food sellers. In fact, Walmart and Target are the two largest grocery stores now in the United States. They've grown from essentially zero thirty years ago. Then traditional grocery chains have expanded. Examples of those might be Albertsons and Kroger, the third and fourth largest national grocery chains now. Their stores have gotten much larger over time. And the chains themselves became national through building new locations and through merger with a lot of local and regional chains.

What drove concentration food retail? Well large stores can take advantage of both economies: the scope that they can offer a lot of different products, and economies of scale they can realize lower costs of offering products. They can do so, as in the cattle example, if they get a lot of people in this case coming through. That allows you to realize scale economy. Changing demographics over time has mattered for that - widespread car ownership, widespread road networks continuing suburban growth provides those deep flows of customers coming to these stores. That allows them to build bigger stores and take advantage of those economies. Now, the firms themselves had to have something to do with this. They really had to develop improved logistics and distribution networks to keep track and restock quickly whatever they were selling through those stores. So, these several long-term factors came together to drive larger stores and greater national concentration.

Now food retailers compete in a little different way than feed firms or meatpacking firms. Retailers tend to differentiate themselves. They offer different combinations of products. They offer different, in particular, combinations of services around the edge of the store. They may have a different emphasis on say organic or on fresh produce or things like that. They differentiate themselves to appeal to different groups of consumers who place different valuations on those amenities that are offered. Therefore, retailers compete not only on prices, but on store formats, store location and the range of products and services offered.

Now, antitrust policy in food retail has been important over the years because of many mergers that have occurred. Responsibility typically falls to the Federal Trade Commission, and they tend to focus - if they're looking at a merger - on whether a combination of two chains will likely lead to price increases or to service cuts. A current issue - and I'll give an example of this - is there's a proposed merger in which Albertsons (the number three U.S grocery retailer) proposes to merge with Kroger (the number four retailer). In evaluating that, will that affect competition? We need to keep several things in mind. First, Albertsons and Kroger - they actually own many different

types of chains. For example, Albertson's own Safeway. Krueger owns Harris Teeter. I don't see Albertsons or Kroger stores where I live in Northern Virginia, but Safeway and Harris Teeter are right around my county. They're two major competitors in my county, so the merger would actually merge those two firms. And the question that would be asked is: if we put those two firms together, will they be able to raise price to customers? That is, will they be able to exert some market power? There are several constraints on them. So, one question is: how easy would it be for their customers to go a little further to other chains? There are competing chains in the next county. Would they lose enough customers if they raised price? It wouldn't really make sense to raise price because they know they'd lose many people to the next county to other chains like them that are seven or eight miles away. So, geographic boundaries of competition matter. Whether competitors are relevant matters. In this area, Harris Teeter and Safeway sell groceries. So does Whole Foods. Whole Foods is a really different format. Organic larger meat counters - they appeal to a different type of customer. So, a further question here becomes, if Safeway and Harris Teeter would be, were to merge, and if they were to raise their price, would they lose enough people to the Whole Foods that that would constrain their pricing? So, the analysis of this thing really comes down to those distant (either in format or in geography) competitors, and whether they impose enough competition to keep those combined firms from raising price. These are the issues that will arise in any type of merger case in supermarkets including the current one.

Okay let me wind up with some concluding comments here on what we've done. First concentrations increased in many agribusiness industries. The concern is that high concentration may allow firms to raise prices to consumers or to cut prices to farmers. That's the key issue in agribusiness. However, this is what makes it tricky. High concentration is not always implied at market power. Increased concentration might reflect efficiency gains from economies of scale as larger plants or stores displace less efficient smaller plants and stores, and therefore might lead to improved service and lower prices. Higher market prices might also reflect the returns to research and innovation as firms offer products of higher quality, and people buy them. So, that's what makes this a tricky issue. And in antitrust reviews, agencies try to consider the potential effects of mergers on competition including not only pricing, but innovation incentives as well. And that's come up in recent years and is likely to continue to be important in the future. Okay, I'm handing it over to you Ashley. I finished up this presentation. Now we're happy to take questions.

Thanks James. Before we open the floor though, I'd like to just briefly introduce our co-panelists: Keith Fuglie, an economist who also serves in our Resource and Rural Economics Division, and Xiao Dong, an economist in our Food Economics Division. Both are co-authors of this report and have joined us today to help answer questions you may have. And as a reminder, any questions can be submitted through the chat feature located at the bottom left-hand corner of your screen.

Alright for our first question, um your chart shows a sharp rise in beef price spreads after 2016, yet concentration didn't change in that period. Could you explain why those price spreads rose?

Uh, yes in...we spend a good deal of time on this in the report, but I think a contributing factor was capacity in the industry. Throughout the period of the 90s and the 2000s, there was excess

capacity in meat packing, and over a long gradual period, a number of plants closed. So, that by around 2015 or '16, it appears that there was no more excess capacity. And I think the combination of concentration, plus restricted capacity, um gave firms the opportunity to exercise market power, and, and we also, we talk about the data and reference some other types of research on just this topic. Um the positive element of that is that this entry also addresses that issue of capacity and appears to be adding capacity to the industries. Um, so focus on capacity that's in the report.

Thanks, another question asks why seed prices of biotech crops rise so much more than those of non-biotech crops?

I think I'll hand this over to Keith.

Ah thanks Jim. Yes, um well one of the key factors I think, was that the development of biotech crops: two things was one, they were very expensive. So, to get to commercialize a crop variety with a genetic trait required a lot of investment in research and development as well as a lot of investment in getting those traits through the regulatory process. That looks at potential impacts on health and the environment. So, there's a lot of higher costs associated with the development of those, of...of biotech crops as well as higher quality and productivity impacts. So, we have seen that these crops have significantly improved productivity at the farm level. Often that productivity comes through uh reducing costs associated with say um, might be substituting for chemicals if you, if you have a genetically resistant - a crop that's genetically resistant to insects, you don't have to use as much insecticide. Or if um you're tolerant to herbicides that means you don't have to do as much mechanical tillage, and so there's less labor and machinery costs associated with using those types of traits. So, the quality improvements, as well as the high research and development and regulatory costs associated with GM crops, has meant that seed prices have gotten a lot higher.

Thanks Keith. Our next question asks: can you explain a little more on what HHI is and talk about the HHI graphs a bit more?

This is Jim. I'll take that. Um, that was the graph by the way that we used for - uh, let me go run back to it while we're here - that we used for um retail concentration. Here it is. HHI stands for Hirschman Herfindahl Index. Hirschman and Herfindahl were economists back in the 90s and 1940s and 1950s, who developed these measures. Um it is a measure that takes account both the number of firms and their market shares. Um, briefly algebraically, it's the sum of squared market share. So, if you're a monopolist and you have 100 percent of the market, the square of that is ten thousand. It's only one firm and so the index becomes ten thousand. That's the highest amount you can get. That's a monopoly. If I had 100 firms - each with one percent of the market - each square of that one percent would be one. If I summed them all up, I'd get 100 firms. So that would kind of range this measure from 100 to 10,000 affected both by the number of firms and by their shares. It's because it captures a wide range and because it's sensitive to changes in number of producers and their market shares at high concentration levels - where I only have two or three producers - um, it's become widely used in government agencies to use as screens for

enforcement decisions um and to report on when they're likely to oppose mergers or not. As a result, it's also widely used in the antitrust bar. Um, but that's the HHI.

Thanks Jim. For our next question: does ERS track entrance into meat packing? Is it publicly available?

I guess I'll handle that one. I wouldn't say we track it or that it's publicly available. The chart I showed you is one that I tracked down from various media sources and put together myself. Now USDA could do so in its administrative records from the Food Safety Inspection Service because they track whether a firm is, whether a plant is open, whether it's...who owns it and how many animals are being moved through and they count inspected livestock moving through it. Um, they...they've made that available at times, and in recent years some other USDA agencies have used that to develop some measures of entry and accuracy. But I wouldn't say it's routinely available and it's not made available to the public.

Okay, for our next question: how are you defining chains for this? That is, does grocery include club stores, dollar stores, etc.?

Xiao, why don't you take that one?

Thanks Jim, that's a great question. Uh, I think this question is in reference to the graph that Jim just previously pulled up on I believe slide seven? For that specific graph, um the way that that was actually taken from another ERS report, and that ERS report if you're interested - we in follow up, we would be happy to provide more details on it, but that report details exactly what formats, what data sources and what assumptions were made to calculate it. I would have to refresh my memory to see if dollar stores are included or not, but I think the question does raise an interesting point in the sense that as we detail in the other report, there is a lot of heterogeneity potentially depending on which county you're in, and Jim discussed some factors that led to the success of non-traditional growth formats. And in, in some counties, it depends, because competition is more local, some factors that led to the success of the big stores might not be able or as successful, and there could be heterogeneity amongst concentration in, in different counties. And some formats such as small format such as Dollar Stores might be more successful in those areas.

Thanks Xiao. Alright, our next question asks: do you have any broiler concentration data for 1990?

Um, I would have to look back again. Um, the pack...the Packers and Stockyards Division of USDA's Agricultural Marketing Service produces concentration data for different livestock species and reports them essentially each year. They only got the authority to do so for poultry. I thought it was the late 80s, but I'm not sure um certainly not at the beginning of our period for example in 1980. So, I recommend that you go....Well ask me and I'll look more in an email, and I'll look more closely for you. Or you can go directly to the Packers and Stockyards Division at the Agricultural Marketing Service and ask when they first tracked broiler concentration. I think it might have been around 1990, but I'm not certain.

Thanks Jim. Alright, for our next question: um, how are trends and prices for GMCs calculated for the early 1990s?

I guess I'll pass that to Keith, but I think it's a trick question - meaning the seeds weren't introduced until 1996.

That's right Jim, um so once the seeds were commercially available um the National Agricultural Statistical Service, for a while they reported on average prices for both GM seeds and non-GM seeds for that crop - for each crop. And then once the GM seed became the dominant seed type of seed being used by farmers (say after about 10 years), then the mass started just, just reporting the uh seed price for the, the GM seed. Now in recent years, NASS no longer continues its seed price series. But it is possible to get some idea of seed prices by looking at the USDA ERS Commodity Cost and Returns Database, which is available on the ERS website. And there you can get a careful breakdown of all the producer costs per acre, including seed costs by commodity and in different regions of the country. And you can combine that with seed, seeding rates um just to you, you know what the cost is per acre, and you know how much seed is supplied per acres, and NASS reports that data, and then you can get an idea of what farmers are paying on average say per 100 weight or per bushel of seed.

Alright...

Well thanks Keith.

Yeah, thank you both. Okay next question: does your price spread analysis include the prices of intermediate inputs such as marketing, management, finance etc.?

Yeah, I think... This is Jim, I'll take this. I think this question is referring to the chart we showed on the choice beef price series, and that series would implicitly include those other costs because, remember what it is: it's the difference between the price received for wholesale beef and the price paid for cattle. That's, that's how it's constructed, and so it should capture costs plus profits including costs for those intermediate inputs like packaging. Although those are not explicitly measured. Again, it's the difference in prices that's being reported here.

Good to know. Alright, next question: do larger seed companies sell traits to smaller ones and does that impact the effect of concentration?

I'll pass that to Keith.

Uh, yes, they do. There's a widespread practice of cross licensing or licensing of traits, as well as germplasm amongst seed companies. So, um and, and Jim referred to that in his presentation that concentration in markets for traits is likely to be even higher than concentration in seeds because a lot of the smaller companies (that are also maybe selling GM seed) are licensing those GM traits from the larger companies. We don't actually know very much about concentration in markets for traits however, or the licensing arrangements that are made. That, that kind of information is generally not publicly available.

Thanks Keith. Another question asks... Large meat packers operate multiple plants: does that affect concentration?

This is Jim. That's a good question. Yes, it certainly affects concentration. Um the interesting aspect there is that if we look in the mid-1970s (when four-firm concentration was 35 as I said - actually in 1980 was 35 - in 1995 it was about 80 four-firm concentration ratio) the number of plants operated by the largest four packers in 1995 was, I think, only one more than the number of plants operated by the large packers in 1980. So, all of that change in concentration came about because they were building bigger plants, not because they were operating more plants. Having said all that, um I think the fourth largest packer operates two plants and the larger ones operate more. And certainly, operating more plants will add to a concentration measure because what we're doing there is measuring the share of sales flowing to a firm - not to any single plant. So multi-plant operation does lead to a higher concentration than we would see if we did not have multi-plant operation.

Thanks Jim. Another question: how have the high levels of concentration in the seed industry affected research investment by these companies?

Good question. I'll put that to Keith.

Yes, thank you. Um, well, we have tried to track R and D investments in, in crop improvement by the major players around the world for the last few decades. And that one chart that Jim showed, is that feed companies had been increasing their investment in research and development in about the same proportion that they were increasing their revenues. So, we have not seen evidence that higher concentration has led to a reduction in R & D investment, and that's one of the key issues surrounding the questions around concentration and market power in the seed industry. The other indicator that we looked at - not only in terms of how much R and D are they spending, but how much new innovations are they producing? And to look at that question, we looked at the number of patents that were being issued in four new crops over time, as well as the number of plant breeders' rights (what we call plant variety protection certificates), which are another form of intellectual property that's actually issued by the USDA. They're not quite as restrictive or not quite as um, they don't provide as much protection as the plant patent does for a developer of a new crop variety, but both of those have shown significant increases in the number of new seed varieties and seed innovations that are being released each year if we go look back over the last two or three decades.

Thanks Keith. Next up, um, this question asks: when talking about seed market concentration, are we talking about field crops or horticultural crops - you know, fruits or vegetables? Are there significant differences in the seed production / marketing between those two groups of commodities?

Uh, I'll pass that to Keith too.

Well, the uh, most of the attention in this area has really been with the field crops - particularly the field crops where genetically modified feed has come to dominate, namely corn, soybean and cotton. In the report, we, well we, we have a lot less information frankly about, about concentration in other seed markets. Um, but in the report one thing we do look at is concentration in the number of new patents and plant variety protection certificates issued across a number of commodities - not just the ones dominated with GM seed, but across a number of

fruits and vegetables as well as other field crops where GM seed are not widely used. So, we look at um how many, you know, what share of the new varieties that are being released or at least the, the number of patents that are being obtained are acquired by, you know, the largest players. And in basically what we find is that across vegetables, uh field crops whether they be GM or non-GM dominated, that typically there will be a small number of companies that have, you know, the largest share of these new innovations or new seed varieties that are coming out. So typically two to four companies uh may dominate the seed market in, in horticultural crops as well as field crops.

This is Jim. Let me just jump in with one more aspect of that. Um in the antitrust investigations in the United States with the Justice Department and in Europe with the European Commission, uh those agencies are able to obtain information under subpoena. And for researchers, when you can get a case like that, it's a great resource because they - in their reports - publish pretty useful concentration data. And um several vegetable markets - certainly not all - but there are several vegetable seed markets in which Monsanto, Bayer, Dow or DuPont actually played significant roles, and in which, two or three seed sellers were really the dominant sellers. So, there were a few vegetable markets that were turned out to be highly concentrated. As Keith indicated, that sort of information is not regularly available. It came about only because of the antitrust investigations.

See, if I could just add one other point on this question, I think that there is an important exception and that is for weak and small grains. This is an area where actually the public sector, the USDA, and the state land grant universities and state experimentations still play a major role in providing finished varieties to farmers. So, there's been less private investment in R and D in wheat and small grains, and the continued important role for public sector breeding to supply improved genetics for those crops.

Thank you both. Alright, that's all the time we have for today. Thank you, Jim, Keith and Xiao for sharing your expertise with us today. And thank you to our listeners for your interest in ERS research. We hope this has been helpful for you. Before we close, don't forget to like, share, and follow ERS on Twitter and LinkedIn. There, you'll find snapshots of our latest data, Charts of Note, and research. That's it for now. Again, thank you for joining us. This concludes our webinar.