# California's Proposition 12 and its Impacts on the Pork Industry[1]

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### *Executive Summary*

This report provides a high-level overview of issues surrounding California's Proposition 12. A challenge to the proposition reached the US Supreme Court, where the Court issued a decision on May 12, 2023, that upheld the California law. As of Jan. 1, 2024, all breeding swine farms will need formal Proposition 12 certification for wholesale buyers and distributors to sell pork into the California market. Pork products already in storage can be distributed until December 31, 2023, although any pork produced after July 1, 2023 must be compliant. Among other things, the proposition imposes new space requirements for breeding sows. All covered pork products sold in California, with few exceptions, must be sourced from the offspring of sows that have been provided at least 24 square feet of usable floor space for each sow, regardless of where the hogs are produced. Because California produces only a small amount of the pork sold there, the proposition will impose space requirements on hog producers across the nation. The costs of these restrictions are widespread and extensive. Farmers face the costs of renovation or the construction of new facilities. These costs are made more significant by recent extreme increases in building costs. Farmers will also face losses in productivity as they move to new production and management systems. This lost productivity will be especially acute in the short run, as the new systems are mastered. The new production systems will lead to increased stress on breeding sows, which in turn will lead to lower fertility and embryo survival rates. The industry must maintain identity preservation and market segmentations. This will involve considerable changes in the logistics of pork product distribution. For many reasons, these costs will have a more severe impact on smaller, independent operations. These operations tend to be less efficient and have lower profit margins. Smaller operations also have less access to the credit needed to finance renovations and new construction. Thus, one important outcome of Proposition 12 will be an increase in the exit of smaller hog operations. The pork industry will become more concentrated with fewer but bigger farm operations. The stresses placed upon the entire production and marketing chain will also favor larger processors, thereby leading to ever-increasing consolidation and concentration of the industry. To the extent that certain segments of the consuming market are willing to pay a premium for pork raised in accordance with Proposition 12, producers choosing to adopt the required production measures may realize new market opportunities through premiums for compliant production. However, the free market will address these issues without the mandates and costs imposed by Proposition 12, and thus an optimal solution would have been to allow the marketplace to allocate products that are differentiated by production practices.

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[1] Research report furnished to the National Pork Producers Council. The views and opinions expressed here are solely those of the author and do not represent views or opinions of any other organization, regardless of affiliation.

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## California's Proposition 12 and its Impacts on the Pork Industry

Proposition 12, the "Prevention of Cruelty to Farm Animals" Act, was approved by California voters in 2018 and its provisions for hogs will become effective on January 1, 2024. Implementation and enforcement of the law was complicated by delays in the release of final regulations describing details of the regulations and a "prohibitory writ of mandate" that temporarily stayed public and private enforcement of the Act. On May 11, 2024, the US Supreme Court issued a *writ of certiorari* to the US Court of Appeals for the Ninth Circuit in which they supported the defendants and upheld the proposition.[2] The case, brought by the National Pork Producers Council NPPC) and the American Farm Bureau Federation (AFBF), argued that Proposition 12 violated the "Dormant Commerce" clause of the Constitution that prohibits legislation that discriminates or excessively burdens interstate commerce.

The Act proposes to "prevent animal cruelty by phasing out extreme methods of farm animal confinement, which also threaten the health and safety of California consumers and increase the risk of foodborne illness and associated negative fiscal impacts on the State of California." The new regulations mandate that all pork sold in California, with limited

[2] *National Pork Producers Council et al. v. Ross et al.*, Case No. 20-55631 (9th Circuit Court of Appeals, 2021). The petitioners argued that the proposition had the "practical effect of controlling commerce outside the State," even when those laws do not purposely discriminate against out-of-state interests.

exceptions, must be sourced from the offspring of sows that have been provided at least 24 square feet of usable floor space for each sow. Enclosures must be sufficiently large enough to allow sows to turn around without touching the sides of the enclosure. The regulations apply to any breeding pigs over 6 months of age and to all whole pork meat marketed in the state, regardless of where it was produced. The regulations exclude comminuted products containing more than just pork and pork used in processed food products.

The next steps for industry and for legislative actions involving animal welfare are unclear. Many legislative options are focused on preventing a 50-state patchwork of conflicting state welfare laws. As I discuss in this paper, the proposition will certainly bring about significant changes to the structure of the pork industry. The proposition will likely lead to renovation of existing hog farm facilities and new construction of facilities that are compliant with the proposition. The pork industry will need to segregate pork products on the basis of compliance with the proposition. This segregation will lead to increased marketing costs and will complicate the logistics of pork marketing practices.

A limited number of exemptions apply to Proposition 12. The restrictions do not apply for animals involved in transportation, research, during individual treatments, and at slaughter. The space requirements are also waived for 5 days prior to the expected farrowing date, while sows are nursing, and temporarily during breeding activities. It is also waived

for hogs being treated by a licensed veterinarian. These exemptions are limited to a maximum of 6 hours per day, not to exceed 24 total hours over a 30-day period.

The limited nature of these exemptions has important implications for breeding, farrowing, and nursing efficiency. These restrictions will likely decrease the effectiveness of insemination services and will likely diminish the overall health of recently farrowed piglets. In a presumed effort to improve the welfare of sows, animals will be intermingled to a much greater degree than is currently the practice. As is true of most livestock animals, efforts to establish social dominance when put into groups will lead to increased morbidity and mortality, something even the state of California admits. Producers that have adopted production practices consistent with the proposition have already realized lower conception rates, lower farrowing rates, and increased non-productive sow days. These effects have been demonstrated in the research findings of animal scientists as well as in the experiences of those farms with Proposition 12 compliant facilities.[3] As is often the case with such mandates, efforts to promote the health and welfare of gestating sows appear to have the opposite effect.

At present, California has a population of 39.2 million people, or about 12% of the US population. In December of 2021, California had a hog inventory of about 85,000 head.

[3] See, for example, L. J. Johnston and Y. Z. Lee, 2013, "Performance and Well-Being of Sows Housed in Pens Retrofitted from Gestation Stalls," *Journal of Animal Science*, 91:5937-5945.

In comparison, the US had a hog inventory of 74.9 million head, implying that California only has about 0.11% of the nation's total hog and pig inventory.[4] Figure 1 illustrates the numbers of hog producing operations across the US. The relative lack of hog production in California is notable. California represents a growing market, with its population expanding by 5.1% between 2010 and 2021.

The consumption of pork products is not homogeneous across different ethnic groups. Figure 2 illustrates total expenditures on pork products by different demographic groups in the US. Consumption is especially high for Hispanic and Asian ethnic groups. California's population is diverse and ever evolving, with Hispanics or Latinos accounting for 40.2% of the population and Asians accounting for 15.3% of the population.[5] These factors reinforce the importance of California as a destination market for pork products produced across the US. Nearly all pork consumed in California is produced outside of the state.

As of February 2021, it was estimated that only about 4% of existing US hog farm facilities conformed to the Proposition 12 space requirements, although the proposition has spurred the building and renovation of compliant facilities.[6] The industry standard sow housing stalls currently average 14-20 square feet. Proposition 12 will bring about significant disruptions and adjustments in the US pork industry and will require extensive

[4] Statistics taken from the USDA's National Agricultural Statistics Service quick stats database.
[5] Population statistics taken from the US Department of Commerce's Census Bureau.
[6] See McCracken, C. "US Pork Supply Chain Locked in Limbo as Producers Await Legal Ruling," Rabobank Research, February 2021.

renovation or new construction to provide facilities that conform to the proposition's requirements.

Proposition 12 also has important implications for international commerce. The US Meat Export Federation (USMEF) has noted that Proposition 12 presents significant logistical challenges for pork exporters using California's port infrastructure and cold storage facilities. The USMEF noted that in 2020, 2.977 million metric tons of pork, valued at $7.72 billion, and representing 29% of total US pork production was exported, with almost 50% of exports transiting through California ports.[7] The Canadian Pork Board filed an *amicus curiae* brief with the U.S. Supreme Court on October 21, 2021, arguing that Proposition 12 has disruptive effects on international commerce and violates the US-Mexico-Canada Free Trade Agreement (USMCA) as well as provisions of the WTO.[8]

In addition to the Supreme Court case, the North American Meat Institute (NAMI) filed a petition challenging the constitutionality of the proposition.[9] These challenges were in part also based upon presumed violations of the Commerce Clause of the US Constitution, where it was argued that California's regulations have a negative impact on the interstate

[7] See the July 9, 2021 letter from Dan Halstrom to Elizabeth Cox, available online at https://www.usmef.org/downloads/USMEF-Prop-12-Comments-7-12-21.pdf.

[8] See https://www.supremecourt.gov/DocketPDF/21/21-468/198155/20211029124644558_21-468acCanadianPorkCouncil.pdf. The brief notes that, in 2020, Canada exported more than 300,000 metric tons of pork to the US.

[9] See *North American Meat Institute v. Becerra*, Case No. 2:19-CV-08569-CAS (FFMx), United States District Court, C.D. California, October 4, 2019. The appeal was denied on November 22, 2019.

commerce of other states. The regulations will also create obstructions to competition from pork producers outside of California. The petition was supported by 20 states, who filed *amicus curiae* briefs in support of the litigation. On February 26, 2021, NAMI unsuccessfully filed a petition with the US Supreme Court to overturn Proposition 12.

California's Proposition 2, which expanded space requirements for egg-laying hens, withstood similar legal challenges. As Proposition 2 demonstrated, these propositions most certainly have impacts on interstate trade and the methods of production in other states. The prominence of cage-free egg production rose substantially across the US as egg producers undertook structural changes to accommodate the space requirements.

The objective of this article is to review the impacts and to estimate the costs associated with implementation of Proposition 12. Many of these costs, such as the costs associated with renovation of existing facilities and construction of new facilities, are apparent. However, other costs that will affect the pork industry are less obvious. For example, I note the potential impacts that the new space requirements will have on the efficiency of breeding and the physical well-being of sows. Many of these costs have been considered in existing evaluations of Proposition 12.

However, other subtle cost changes have received less attention in the existing studies of Proposition 12. To the extent that the Proposition creates a bifurcation of the market with pork products segmented into those that are compliant and those that are not, the

entire marketing chain from processors to retailers will be tasked with preserving the identity of pork products and effectively segmenting the market to identify those products that are compliant from those that are not.[10] Past efforts at preserving the identity of differentiated basic commodities such as corn and rice have proven to be both expensive and difficult to maintain. These costs have both short-term and long-term implications. A likely outcome in the long run will be widespread adoption of production practices that conform to Proposition 12. Because such changes necessarily apply to long-lived assets in the form of production facilities, full adjustment of the industry to Proposition 12 is likely to take several years.

## The Costs of Proposition 12

Proposition 12 will bring about fundamental changes in the structure of the US pork industry. Consumers in some states, with California being a leading example, are becoming increasingly sensitive to animal welfare issues. This has been shown to be especially true among younger consumers, who typically express greater concerns for animal welfare and environmental externalities.[11] However, consumers may not fully comprehend the nature

[10] As one anonymous industry representative noted, this will require doubling the number of stock-keeping units (SKUs) that the industry will have to manage throughout the marketing chain.

[11] For example, researchers in Norway found that young consumers tended to be significantly more concerned with sustainability and animal welfare (*Norwegianscitechnews*.com, 11-2022).

and finer points of livestock production systems or the likely impacts of legislated actions meant to improve animal welfare.[12] As existing facilities are replaced as a normal course of business, it is likely that new designs that conform to the types of animal welfare considerations reflected in Proposition 12 will be implemented, even if such facilities are significantly more expensive.

A major source of the costs of adjustment to such regulatory changes relates to the uncertainty that these changes introduce to the industry. California's animal welfare regulations have been upheld, but the legislative actions of other states as well as those of the US Congress remain unclear. Uncertainty, by its very nature, introduces tangible costs to any business operation. Alongside efforts to have the restrictions overturned were several attempts to delay implementation of the space requirements. The conditions imposed by Proposition 12 will be fully enforced beginning in January of 2024, though any pork produced after July 1 must meet the conditions of the proposition. Many farmers and much of the industry were hesitant to commit to such fundamental changes if the likelihood and timing of the space requirements were unclear. However, this uncertainty has been resolved and many producers are already renovating existing facilities and constructing new hog barns in order to conform to the proposition. The implications for market demand and

[12] Proposition 12 also imposes space requirements for veal calves (43 square feet) and egg-laying hens (1 square foot). The support of consumers for any specific restriction, such as that applying solely to hogs, is unclear and it is possible that consumer concerns about specific production practices may be dominated by only certain types of animals, such as veal calves and hens.

supply in the future are largely unknown. This uncertainty includes consumer preferences for Proposition 12 compliant pork products. The additional willingness to pay for compliant products is unknown and the overall impact on pork supply likewise remains unclear.

**Renovation and New Construction Costs**

Renovation and new construction represent major irreversible commitments requiring very significant investments. These costs are exacerbated by the very active and volatile nature of construction industries in the US. Building material costs increased significantly as the US economy emerged from pandemic quarantines. A February 22, 2022, *Fortune* article noted that lumber prices experienced a 227% increase between August 2021 and February 2022, though prices have returned to long-run normal levels since.[13] Building materials have realized considerably volatility in recent years. Crude oil, which is an important ingredient in many construction materials, has risen by over 250% since mid-2020. Figure 3 contains an illustration of real prices of important building materials.[14] The extreme volatility of prices for building materials is apparent. Huge swings in lumber prices were experienced, suggesting the possibility of the bubble noted by the *Fortune* author. Asphalt prices, which are important in the construction of roofing materials and paved

[13] L. Lambert. "We're In Another Lumber Bubble," *Fortune*, February 22, 2022, available online at https://fortune.com/2022/02/22/new-lumber-bubble-price-spike-british-columbia-board-feet/ (accessed May 15, 2022).

[14] Building materials prices were taken from the Bureau of Labor Statistics' producer price indexes. The indexes were deflated using the consumer price index from the same source and are normalized to a value of 1.0 in January of 2004.

surfaces, reflect the tremendous increases in oil prices. Nearly all the relevant building materials are at exaggerated levels relative to normal long-run price levels. Lumber is an important exception although just a year ago lumber prices were several times higher than current levels.

Renovation and new construction typically require long-term credit. Interest rates have risen significantly in recent months, adding to the costs of renovation or new construction in order to comply with Proposition 12. In August of 2023, the USDA Farm Service Agency interest rate for direct farm operating loans was 4.875%.[15] In May of 2021, this rate was 1.75%. The average bank prime loan rate rose from 3.25% in March 2022 to its current (August 2023) level of 8.25%. For a $15 million loan financed for 10 years, this 5% change adds $4.48 million to total payments. Figure 4 illustrates the average 15-year fixed mortgage rate for US banks. Current levels surpass anything realized in recent history.

An important but less obvious cost associated with renovating or constructing hog facilities arises from the irreversible nature of construction. That is, in addition to the obvious cost of materials, any new construction imposes a loss of option value for the investor. If the restrictions associated with Proposition 12 are changed at some future date, it is possible that facilities that were made to be compatible with Proposition 12 may not

[15] It should be noted that these USDA guaranteed loans have a limit of $400,000, which is a small proportion of the total costs of constructing a new hog barn.

satisfy the new requirements.[16] Further to this same point, because the imposition of restrictions always has negative impacts on efficiency, relaxing of the restrictions may leave producers that did invest in new facilities at a competitive disadvantage.[17]

I surveyed industry experts, academic research, and discussed costs with several producers that had already converted their facilities to be compliant with Proposition 12. It is important to recognize that the costs of new construction and conversion of existing facilities vary widely according to individual circumstances. Although the costs are largely consistent across the alternative sources discussed below, each case had its own unique conditions.

According to Hog Slat, Inc., as of August 2023, a newly constructed shallow pit design farm that is Proposition 12 compliant would cost $2,100-$2,800 per sow.[18] An equivalent deep pit design would cost approximately $2,600-$3,200 per sow. These cost figures do not include excavation, utilities, roads, or wells. The costs of renovating an existing farm to be compliant using only the existing barn space would be $170-$750. This does not include the loss in throughput that such a conversion would entail. Going from

[16] For example, Rule 901:12-9-02 of the Ohio Administrative Code requires group housing for all pregnant sows by 2025 but allows for breeding sow placement in individual stalls until pregnancy is confirmed. Farmers have transitioned to the new standards in facility design, but their new facilities will not satisfy the requirements of Proposition 12.

[17] An important engineering result—the Le Chatelier Principle—holds that the imposition of restrictions on a profit-maximizing producer will always lead to lower profits (or at least no higher profits).

[18] Hog Slat, Inc. is a major producer and construction coordinator for hog barns and associated facilities. Costs were supplied by Mr. David Herring, who is vice president and founder of the firm.

18 ft$^2$ to 24 ft$^2$, for example, necessarily results in a loss of throughput of about 25-30%.[19] If a farmer instead decides to add additional barn space to keep throughput constant, the costs will be about $450-$850 for a shallow pit design and $650-$1,050 for a deep pit design. There is significant variation in what is being done by individual growers. Likewise, the starting point in terms of equipment vintage and condition means that the costs of conversion will differ significantly across farms.[20]

Renovation may be more costly than new construction due to demolition, removal, and disposal costs and depending on the age and condition of the facilities. Other estimates put the cost of new gestation space at about $2,150 per space for Proposition 12 compliant facilities as compared to $1,500 for standard gestation stalls—a 43% difference in cost.[21] Construction of a new facility covering the farrow to wean period of production has been estimated to be about $3,600 to $4,000 per sow. About 75% of that cost is associated with the facility while 25% applies to land and infrastructure. Facilities that are compliant with Proposition 12 are estimated to cost about 22% more than conventional facilities. These costs vary substantially according to the size of the operation. The above estimates apply

[19] Crate sizes vary across different facility arrangements, but a typical arrangement is 2 ft. by 7 ft. or 14 sq. ft. At a sow price of $48/cwt. (October 2, 2023), a 5,000 sow operation would suffer $324,000 in lost throughput per cycle.

[20] Mr. Herring noted that renovation and conversion could range in comparison terms from a "Geo to a Cadillac."

[21] Cost estimates taken from Compeer Financial presentation, "Financial Cost of Proposition 12," October 25, 2021, and from personal communication via email with David Herring, Vice President of Hog Slat Incorporated, on August 16, 2023.

to an operation size of 5,200 sows. However, smaller operations will pay considerably more per animal. A farm of 1,000 animals will have costs that are about 15% higher per animal. These costs are about 10% higher for a farm of 2,600 sows. This suggests that construction of a new deep pit design facility that will allow 5,200 hogs to have the space requirements mandated by Proposition 12 will cost about $16.6 million, not including land and infrastructure (Herring, 2023 and the author's calculations).

**Producer Experiences**

To gain more specific information regarding compliant new construction and renovation, I spoke with four producers that had adopted Proposition 12 compliant production practices through construction of new facilities and/or renovation of existing facilities.[22] Specific names and details of those interviewed are withheld to maintain the anonymity of individuals.

*Producer A (Ohio)*

Producer A is in the process of breaking ground on a Proposition 12 compliant hog operation. This producer will operate two adjacent 2,500 hog farms, for a total of 5,000 sows. The budgeted amount and expected cost for this new construction is $10 million. This does not include any land or excavation costs. They initially considered renovation with space being added to maintain throughput. This would have cost $3.3 million, or

[22] Discussions with producers took place in August 2023.

about $665 per sow. An important consideration in any decision of whether to convert is the premiums that a processor might offer for pork that is certified to be "Proposition 12 Compliant." The costs of conversion must be weighed against the premiums, if any, that compliant pork products will earn. This producer reported a wide range of premiums that largely varied with the length of the production contract.[23] Premiums for compliant hogs typically ranged from $6-$10 per head. This producer had heard of premiums as low as $4 per head and as high as $15 per head.

*Producer B (Iowa)*

This producer is tearing down an existing facility and building a new facility. A new gestation barn would cost about $1,700 per sow for standard technologies and $2,300 per sow for compliant facilities, though it was noted that a standard cost for new construction was $4,000 per sow. Remodeling could have been accomplished for $1,000 to $1,200 per sow if no additional space were to be added. This also results in a 30% reduction in throughput, which must be added to the cost of conversion. If new space was added to maintain the same level of throughput, the cost would be about $1,550 to $1,700 per sow. If productive assets are liquidated to make room for new technologies, the opportunity cost of lost production must also be considered. Put differently, a grower that foregoes

[23] Nearly all hogs in the US are produced and marketed under contracts with processors.

conversion does not bear the cost of conversion but also is able to continue to produce using current assets.

*Producer C (Indiana)*

This producer was an early adopter of Proposition 12 compliant technologies. They converted their facilities in January of 2022. Their farm houses 10,000 sows. Their facilities were converted to be compliant, and they did not have any new construction. They estimated the costs to be about $3,000 per sow for new construction at the time that they undertook facility conversions. Their facilities already had loose sow housing systems, and in that case, the cost of conversion was only $150 per sow, again demonstrating that the costs of converting existing facilities to be compliant with the proposition depends significantly on the starting point for any such conversions. They also noted the value of manure as fertilizer on their farm. Any temporary or permanent decrease in the size of the operation would cause a modest loss of revenue from the value of manure. At the margin, they realized about $80,000 from manure sales each year on their 10,000-sow farm. This producer expressed strong concerns that the proposition should not be viewed as a change that results in an overall decrease in the health of sows. As I discuss in detail below, the group housing that Proposition 12 will bring about often raises concerns about morbidity, mortality, and decreased farrowing due to sow aggression in group pens. This grower was

adamant that any direct link between sow health and the proposition should be interpreted with caution.

*Producer D (Pennsylvania)*

This producer manages a very large scale of production—about 40,000 sows—that has been converted to Proposition 12 compliant technologies. They offered very precise estimates of the costs of conversion of existing facilities, noting that the cost depends on the starting point prior to conversion. If converting at the pre-implant stage of production in crates that already meet the 24 sq. ft. requirement, the costs were $81.19 per sow (on 24,126 sows where conversion cost $1,958,890). For facilities at the pre-implant stage of production with existing stalls of 21 sq. ft., the cost of conversion was $207.71 per sow (for 17,760 sows with a total cost of $3,689,000). For farms at the pre-implant and post-implant stages of production, which accounted for 11,200 sows and with 20.5 sq. ft., the cost was $2,500,000, or $223.21 per sow. This farmer did not have to convert any fully crated farms but they were quoted $1,000 per sow for such conversions. All such costs significantly depend upon the starting point and the amount of preparation work required. For new facilities, this producer estimated cost of $3,500-$4,000 per sow, depending upon excavation and permitting cost.

*Summary of Producer Opinions*

Several points emerge from the preceding discussions with growers that have already changed their operations to be compliant with Proposition 12 or that are in the process of making the conversion. The first is that there is a very wide range of costs associated with making production changes to make an operation's hog output compliant with the proposition. The costs of building a new gestation barn with technologies that are compliant generally ranged from $3,600-$4,000 per sow, although such costs do not include demolition, roads, wells, utilities, land, excavation, and permitting costs. These costs are likely to vary widely according to location and the existing facilities, if any. In addition, construction costs have risen significantly since these producers undertook construction and renovation. If we assume a conservative 12.5% increase in the costs of materials and labor for new construction, a facility that is fully Proposition 12 compliant would cost about $4,500 per sow.[24]

Renovation of existing facilities is also costly and, in some cases, may cost more than building new facilities. Remodeling an existing farm to be compliant with the proposition generally costs a grower about $1,000 per sow, though depending on existing facilities, the costs could be less than $100 per sow. However, once again, the costs vary widely according

[24] The final demand construction producer price index rose by about 15% between January 2022 and August 2023.

to the existing facilities, especially the size of existing crates. If a farm is at the standard size of sow crates (14-21 sq. ft.) and if no new construction occurs, the farm will realize a reduction in throughput of about 30%. For example, a 2,500-hog farm of the typical size would have to reduce its throughput to about 1,665 because of the lost floor space.

To put these costs into context, consider construction of a 5,000-sow farm, which is a common size for a commercial hog farm. According to the preceding discussions, this would cost about $18-$20 million. At current interest rates (assume 6%) and if the farm's facilities have a lifetime of 10 years (and an accompanying loan with a 10-year term), the farm would have a loan payment of $222,000 per month and would pay $26.64 million over the life of the loan. In comparison, a conventional farm with non-compliant facilities would cost about $3,000 per sow. Under the same loan terms, the farm would have a monthly payment of $166,531 and the farmer would pay $19.9 million over the life of the loan. The differences are substantial and illustrate the impact of high interest rates.

**Costs and Farm Size**

The differences in construction costs across different sized hog farms have important implications for how the industry will be impacted by Proposition 12. Smaller farms will be more constrained by access to capital and thinner margins. Figures 5 through 7 illustrate

some important differences in the financial situations of different sized hog farms.[25] The USDA segments farms according to annual sales. The diagrams illustrate financial conditions for the following categories of total annual farm sales—less than $100,000, $100,000-$249,999, $250,000-$499,999, $500,000-$1 million, and over $1 million. The farms considered are those for which their principal designation is as a hog farm, meaning that the largest share of farm's value of production is attributable to hogs.

The financial condition of a business operation is heavily influenced by the availability and cost of borrowed capital. Figure 5 illustrates the leverage position (total debts over total assets) in the top panel and the rate of return to equity in the bottom panel. Each portion of the panels represents the development of financial indicators across different economic classes of farms and the green bar represents the average value over the 1995-2019 period. The first block applies to all farms and then moving left to right, across increasingly larger (by sales) classes of farms.

Hog operations tend to be much more highly leveraged than is the case for other types of farms. According to the Economic Research Service of the USDA, the debt to assets ratio for all US farms averaged about 8.2% in 2020. In contrast, the 2020 debt to asset ratio for farms specializing in hog production is 22.5%. This demonstrates the fact

[25] Statistics taken from the ARMS Data Analysis Resource (https://my.data.ers.usda.gov/arms/data-analysis).

that hog farms tend to be more dependent on borrowed capital than farms in general and that the leverage ratio tends to increase with farm size. This is not surprising in that the high debt to asset ratio reflects the fact that hog farm facilities require a substantial up-front capital investment and therefore hog farms require borrowed capital to a greater degree than farms in general.

The lower panel of Figure 5 contains the rate of return to equity for hog farms of various economic classes. The return to equity on hog farms tends to be progressively lower for smaller farms, as reflected in the value of production. This suggests that smaller farms realize a lower return to investments and therefore will likely realize less favorable terms of credit. This has important implications for the ability of farms to undertake the significant capital investments that conformity to Proposition 12 would require.

Figure 6 presents net farm income and the farms' operating profit margin. Again, the financial standing of smaller farms tends to be much less favorable than is the case for larger farms. The drop is especially substantial when considering the smallest category of farms—those with annual sales of less than $100,000. This smallest category of farms tends to have net incomes that are close to zero and operating profit margins that are significantly negative. Again, this suggests that the smallest hog farms will be the least able to undertake the changes that would make facilities conformable to Proposition 12.

Finally, we consider two measures of hog farm efficiency. The first is given by the ratio of net cash income to total cash expenses. The second focuses on feed efficiency and is given by the ratio of livestock sales to total feed expenditures. In both cases, the smallest category of farms tends to be significantly less efficient, both in terms of the total operation and in terms of feed efficiency. Overall farming efficiency tends to be moderately higher as farm size increases. In contrast, feed efficiency is similar across all economic classes of hog farms except for the smallest farms, which are substantially less efficient.

The review of hog farm financial conditions provides several important insights that are all consistent in the implication that smaller farms will be impacted much more significantly than larger hog farms. The statistics reveal that hog farms are much more highly leveraged than farms in general and therefore are more dependent on credit markets for their survival. Hog farms will be affected by recent interest rate increases much more than other types of farms. Adopting production processes and methods that are compatible with the requirements of Proposition 12 will require substantial access to borrowed capital. As noted above, the total investment involved in the construction or renovation of facilities that conform to the space requirements will be several million dollars, making access to credit a critical variable in the long-run survival of hog farms. Creditors will consider these financial ratios and variables when evaluating loans and these evaluations are likely to be especially negative for the smallest hog farms. These farms have the lowest relative incomes

and profit margins. The statistics also demonstrate that the smallest farms tend to be significantly less efficient, both in terms of overall returns over expenses and in terms of the efficiency of hog feeding.

These economic facts have important implications for how California's Proposition 12 is likely to impact the US hog sector. Concern over the economic viability of small and limited resource farms continues to be an important factor shaping US agricultural policy. The sectoral changes that Proposition 12 is likely to trigger will be unfavorable for smaller hog farms, who will have less access to credit and who will be less able to undertake the investments necessary to bring facilities into compliance with the space requirements of the proposition. This will hasten the concentration of the hog farming industry, with smaller farms exiting the sector, leaving a US hog industry that has fewer but larger farms. Those farms with thin margins, which tend to be the smallest operations, will be the first to exit the industry. Likewise, efficiency differences that favor larger operations will play a role in smaller farms being the first to exit the industry.

According to the 2017 *Agricultural Census*, there are 58,180 independent hog farmers. These independent farmers had 24.9 million hogs in inventory. Contractors and integrators and contract growers numbered 8,259 and had 47.5 million hogs in inventory. Independent growers with more than 2,000 hogs numbered 2,462 and had 22.2 million hogs in inventory. In contrast, of the farms operated by contractors or contractees, 5,862 farms

had 2,000 or more hogs in inventory and accounted for 29 million hogs. These statistics demonstrate that hog farms with production contracts tend to be larger and account for a larger share of hog production (inventory) than independent growers. It is likely that the processors/integrators will be a driving force in encouraging facility changes that conform to the proposition. I have shown that larger farms tend to be more efficient and more profitable. Thus, an obvious inference to emerge from this consideration of the 2017 census statistics suggests that the proposition will likely push more farms to adopt production contracts. The proposition will therefore hasten the transition from independent to contract growers.

Finally, a subtle cost factor that favors larger growers pertains to delivery practices and the associated segregation of compliant and non-compliant hogs. Larger growers can deliver larger loads of hogs that are consistent in terms of their adherence to the requirements of Proposition 12. A processor is better able to keep hogs segregated according to their compliance when a large grower delivers a significant volume of hogs. It may be more difficult to maintain segregation when a processor is accepting numerous smaller loads of hogs from a collection of small growers. This may influence the premiums paid for hogs produced in compliance with the proposition. Large growers may receive higher premiums because it is easier for processors to take delivery and maintain segregation.[26]

[26] This point was raised by one of the large growers that I interviewed for this study.

**Reductions in Available Space and Throughput**

An obvious cost that will be borne by hog producers pertains to the fact that an operation of a given size will suffer a reduction in output when facilities are renovated to make the necessary space available to sows. This space must be taken from existing uses. According to a recent report by Rabobank, if stocking density is reduced to meet the proposition's space requirements, production flows will drop by at least 25%.[27] This naturally implies a reduction in herd sizes and a flood of new construction to meet the requirements. According to the Rabobank report, to comply with Proposition 12, at least 15% of US hog producers will need to convert to the new facility requirements.

These changes will bring about costs associated with lost stall space, which will reduce the overall output of facilities of a given size that choose to convert. Estimates made by an anonymous industry observer suggested that if there is no change in the size of a gestation barn, renovations to make the facility compliant with Proposition 12 will require a 25% reduction in the size of the sow herd, a 6% reduction in the farrowing rate, and a 0.67 pig reduction in pigs weaned per sow. These changes result in an additional cost of $17.59 per pig because of reduced pig throughput. The extent to which the processors and

[27] See McCracken, C. "US Pork Supply Chain Locked in Limbo as Producers Await Legal Ruling," Rabobank Research, February 2021.

integrators agree to offer premiums for hogs grown under the new requirements will be a major factor in determining the adoption of the new production techniques.

**Farm Productivity Declines**

Although the space requirements are intended to improve the welfare of pigs and hogs, there are many reasons to be concerned that changes in sow housing arrangements will bring about added stress to the animals. The existing science does not support the intentions of the regulations—hogs will be worse off under the new restrictions. Mixing animals together, as would be common in many of the conversion scenarios, will induce stress as animals compete for dominance and feed. Animals are likely to fight, therefore causing increases in morbidity and mortality. This in turn will also negatively impact fertility and embryo survival rates. Competition for social dominance in the new production methods is expected to increase sow mortality by 3-5%. The requirements of the proposition have limited exemptions for sows undergoing breeding and this will necessarily increase the amount of time that sows are housed together.

Research indicates that conversion to Proposition 12 compliant production practices could bring about a drop in farrowing rates of 6-10%. Feed costs will rise due to a drop in the productivity of sows. These costs are estimated to be $0.72 per sow per unproductive day, or an additional 5 pounds of feed per day for an additional 35 days. These changes

imply an additional cost per pig of $0.13-$0.22. Changes in reproduction rates will decrease the number of pigs born per sow by 0.65 pigs, representing a cost of $2.46-$3.79 per pig.

Johnson and Li (2013) found that 97.6% of sows in stalls produced a litter but only 92.2% of sows in group pens farrowed a litter.[28] Similarly, 90.8% of sows in stalls completed the relevant study as compared to only 84.2% of sows in large pens. Sows were removed from the study due to poor milk production and poor reproductive performance. Sows were also removed due to morbidity and mortality losses, largely due to animal aggression. Large pens that did not permit animals space to retreat realized the largest effects of sow fighting.

Although experience with these new production methods is limited, one can be certain that conventional housing arrangements represent the economic optimum, at least at the time the facilities were constructed. Therefore, there are reasons to conclude that productivity will suffer because of the proposition.

Productivity will also suffer because new production and management systems take time to master. Hemsworth and Coleman (2011) found that the skill of stock people can affect the performance and health of sows.[29] David Herring of Hog Slat, the leading facility construction firm, estimated that production costs could increase by 5-8% in the short run,

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[28] , L. J. Johnston and Y. Z. Lee, 2013, "Performance and Well-Being of Sows Housed in Pens Retrofitted from Gestation Stalls," *Journal of Animal Science*, 91:5937-5945.

[29] P. H. Helmsworth and G. J. Coleman. 201. "Stockperson Behavior and Animal Behaviors," *Human-Livestock Interactions: The Stockperson and the Productivity and Welfare of Intensively Farmed Animals*," 2nd Edition CABI, Wallingford, UK, pp. 103-119.

until the new techniques are mastered by producers.[30] An anonymous producer that had adopted the new technology noted that the learning period was much more expensive than they had expected and that there is an inherent increase in the need to manage gestation animal care in going to a higher percentage of sows in pens versus individual stalls. Producers also noted that difficulties in mastering the new techniques were very dependent on the quality of the hired staff.

**Regulatory Overhead**

The adoption and enforcement of new regulations always involves additional regulatory costs. These costs will be borne by both producers and consumers of pork. The enforcement process remains unclear in many respects but is likely to involve auditors working as third parties or on behalf of the California Department of Food and Agriculture (CDFA), the regulatory agency responsible for enforcing the restrictions of the proposition. The CDFA and California State Department of Public Health have been jointly tasked with promulgating the rules and regulations for the implementation of the proposition. California's Health and Safety Code (HSC) Section 25993.1 states that a business owner or operator must rely in good faith upon a written certification by their supplier that pork was not derived from an animal confined in a manner inconsistent with the proposition. The

[30] Personal communication via email, April 11, 2021.

California code provides for a $1,000 fine and 180 days of incarceration for a violation of the proposition.

The current draft rule of the CDFA describes a certification process that will be carried out by the CDFA or by a certifying agent, who must be accredited by the CDFA. The regulations also require that each producer and handler of pork hold a valid certification and that any pork handler selling meat in California must be registered. The proposition requires that all shipping invoices, bills of lading, and shipping manifests for all shipments of whole pork meat entering the state or transported within the state for commercial sale in California shall include the statement "California 24+Compliant." These additional requirements, taken as a whole, suggest rather substantial increases in the cost of trading pork products.

One can imagine that the proposition will create a new industry of third-party agents providing certification. This industry will certainly involve costs that will be borne by California pork consumers and producers providing pork to the California market. This regulatory overhead is commonly referred to as "deadweight costs" by economists. That is, costs that do not reflect benefits. From a scientific perspective, the welfare of hogs will not be appreciably improved by the restrictions and may, in fact, be diminished. California consumers and pork buyers elsewhere may realize some benefit from the knowledge that the pork that they are enjoying was derived from pigs that had extra space. However, as

previously noted, the restrictions also apply to egg-laying hens and veal calves and the precise motives underlying voters' intentions are unclear. Of course, third-party certification agents will benefit from the new demand for their services.

These costs will be shared by pork consumers, retailers, processors, and producers. It has been noted that a bifurcation of the market whereby pork commands a premium in California but is made cheaper outside of the state is likely to emerge in the short run. A considerable volume of pork that is currently shipped to California will instead be channeled to consumers in other states, thereby lowering the price outside of California. Likewise, considering the considerable volume of pork that is exported from the US, import markets may also realize lower prices.[31] High market segmentation costs (discussed next) will likely encourage widespread adoption of the standards as it may be cheaper overall to adopt the new standards for all pork than to maintain separate markets for certified and non-certified pork.

The difficulties imposed by Proposition 12 on the retailing industry are illuminated in a recent response from the McDonalds' Board of Directors to a letter to shareholders from financier Carl Ichan. Mr. Ichan's letter asked the firm to commit to sourcing its pork from

[31] The USDA's Foreign Agricultural Service (FAS) estimates that 26% of the projected US production of 12.8 million tons will be exported in 2021. See "Livestock and Poultry: World Markets and Trade," USDA-FAS, April 9, 2021.

suppliers that abide by Proposition 12's standards regardless of the law's status. The response stated:

> *"McDonald's only sources approximately 1% of U.S. pork … Mr. Icahn has asked for new commitments … requiring all of McDonald's U.S. pork suppliers to move to 'crate-free' pork and set specific timeframes for doing so. The definition of 'crate-free,' conjured up by the Humane Society of the United States (HSUS), is so obscure that it represents an extremely niche market comprising less than 0.1% of U.S. pork production. This presents a challenge of supply. What Mr. Icahn is demanding from McDonald's and other companies is completely unfeasible. Based on current estimates, McDonald's would require at least 300-400 times the animals housed today in 'crate-free' systems to keep our supply chain running. It also presents a cost challenge. McDonald's today pays a premium to purchase group-housed pork in accordance with our 2012 commitment. Sourcing from this niche market … would significantly increase those costs, placing a burden on all aspects of our business, our supply chain and McDonald's customers, while lacking the broad support of industry experts … his campaign would have one certain outcome: a greater financial burden on customers.*[32]

**Market Segmentation Costs**

A bifurcated marketplace necessarily means that different qualities of a commodity that may not be obvious to the consumer must be identified and preserved throughout the marketing chain. Pork produced from pigs raised on operations that satisfy the space requirements of Proposition 12 must be identified and kept separate throughout the entire marketing chain, from farm, to processor, wholesaler, and retailer. Any agent in the marketing chain must be able to identify and keep separate "certified" pork products, under

[32] https://www.nationalhogfarmer.com/news/mcdonalds-responds-icahns-call-eliminating-gestation-crates

penalty of law. A concerned consumer must have confidence that the pork that they are purchasing is sourced from operations that satisfy the space requirements. Outside of a package label, consumers have no way of discerning how the hogs that were processed into the pork products on grocery shelves was produced.

At the processor level, logistical difficulties are likely to arise as compliant and non-compliant hogs are taken to the plant for processing. The product must remain separated throughout all stages of processing and eventually through packaging, wholesaling, and retailing. It is likely that processors, especially large ones, may find it more efficient to accept only one type of hog—compliant or non-compliant. This could close or complicate access to local markets for certain producers, increasing their own logistical costs. This could also force producers to adopt compliant production practices in order to have access to the relevant processors. These logistical complications may be especially acute for small producers, many of which lack the means to simply adopt new technologies. These complications could lead to a geographic bifurcation where local plants only accept hogs produced with compliant (or non-compliant) technologies. It is relevant to note that hogs, as a commodity, are costly to ship, making the location of plants an important factor in the economic well-being of local producers.

This type of identity preservation may be especially difficult and costly for operations that utilize bulk pork commodities. By their very definition, such bulk commodities are

typically homogeneous in quality and may be highly processed prior to reaching the end consumer. Large-scale food service operations often purchase very large amounts of lower valued trim cuts which may be comingled from a variety of sources. For such operations, it will be costly to identify and segment pork derived from hogs produced under the restrictions of Proposition 12.

The difficulties associated with maintaining identity preservation have been demonstrated in the cases of corn and rice. A form of genetically modified corn, known as Starlink, was not approved for human consumption, and therefore had to be kept separate from other corn hybrids. A similar case arose for MIR-162, a genetically modified corn hybrid from Syngenta that was not approved for sale in China. It proved impossible to prevent these corn hybrids from being comingled in the overall corn supply. Significant economic losses were realized by the companies that manufactured the corn seed as well as throughout the marketing chain. Prices to farmers dropped when portions of the global market for commodity corn were closed due to comingling. Numerous product recalls occurred, and agents throughout the marketing chain realized significant economic losses due to the loss of important markets for corn and commodities that were made from corn.

Questions arise in such cases as to who carries the liability associated with violations of the regulations. It may be difficult to ascertain exactly who is responsible for the loss of identity preservation in cases of comingling or other inadvertent violations of the space

requirements. The logistics associated with ensuring that all pork sold in California satisfies the proposition are complex. Such complexity adds to the basic costs of business for merchants selling pork in California and for processors and wholesalers supplying pork to California. It is difficult to assign value to this additional logistical burden, but the costs are most certainly substantial.

## Processor Premiums

To this point, I have focused attention on the costs of making the changes necessary to bring individual farms into compliance with the space requirements mandated for sows by California's Proposition 12. Because of the prominence of the California pork market and the fact that pork production in California is miniscule relative to its consumption, it is likely that many farms will have to undertake renovation of existing facilities or construction of facilities that are compliant with the proposition as existing facilities age out and are replaced by new construction. I have also noted the changes in market structure that will occur in response to the Supreme Court's upholding of Proposition 12. Pork products will need to be distinguished by whether (or not) they are compliant with the proposition. The market will be bifurcated according to production technologies. Growers will need additional compensation to encourage the long-term investments that the proposition demands.

Herein lies a potential opportunity for compliant growers, albeit one that the free-market is best suited to address. Food product labeling that provides details regarding production practices (e.g., "cage-free," free-range," "organic," etc.) may offer producers new opportunities to differentiate their product.[33] Some producers that have adopted production practices that are compliant with Proposition 12 report premiums of $6-$10 per head, though the industry is still negotiating premiums and industry-wide standards have yet to be established. One producer noted that premiums tended to vary with the length of the production contract, with longer contracts generating higher premiums. Tyson and Hormel, two major pork processors, have already announced that they will comply with Proposition 12.

However, mandating all producers to comply, and therefore forcing all consumers and industries in the entire marketing chain to comply, would unnecessarily impose costs across the entire economy. The freedom to choose product attributes is a hallmark of the free-market system and legislation that enforces the opinions and attitudes of special interests on everyone eliminates this choice and imposes costs on the entire market. As the quote from McDonalds notes, a certain outcome of Proposition 12 is a greater financial burden on customers.

[33] For example, Goodwin, Marra and Piggott (2016) found that food products labeled as being "GMO-Free" cost an average of 73% more than products lacking such a certification. See B. K. Goodwin, M. C. Marra, and N. H. Piggott, "The cost of a GMO-free market basket of food in the United States," *AgBioForum* 19, No. 1, 2016.

## Concluding Remarks

Proposition 12 stipulates that pork sold in California must be sourced from sows that have at least 24 square feet of space in breeding and finishing facilities. While the restrictions were to be implemented on January 1, 2022, litigation temporarily delayed its enforcement. The Supreme Court upheld the proposition and the constraints become fully binding in 2024. As of Jan. 1, 2024, all breeding swine farms will need formal Proposition 12 certification for wholesale buyers and distributors to sell pork into the California market. Pork products already in storage can be distributed until December 31, 2023, although any pork produced after July 1 must be compliant. Producers already in compliance can self-certify until December 31, at which point they must be certified by an auditor approved by the California Department of Food and Agriculture. Market impacts will be gradual as pork already in the marketing chain will be gradually exhausted.

The proposition will be costly to the production and marketing chain for pork in the US. At present, only about 4% of facilities satisfy the space requirements, though many growers are undertaking the investments necessary to produce compliant pork products. The uncertainty surrounding the implementation and enforcement of the proposition led to a "wait and see" attitude by many in the pork producing sector, but this uncertainty has now been resolved. Although the details regarding implementation and enforcement have

been resolved, uncertainty still exists as to whether additional states will adopt their own unique regulations and therefore whether producers will be forced to comply with a 50-state patchwork of laws.

Renovation and new construction costs run into several millions of dollars for the typical hog operation. Estimates of the cost of new construction vary considerably but mostly ranged from $3,600-$4,000 per sow in 2021. If we assume a 12.5% increase in the costs of materials and labor for new construction, a new facility that is fully Proposition 12 compliant would currently cost about $4,500 per sow. Estimates of the cost to renovate existing facilities to be compliant with the proposition vary widely and depend largely on the starting point for the renovation. It may cost as little as $100 per sow or as much as $1,000 per sow. In some cases, depending on the vintage of existing facilities, it may be more costly to renovate than to build new barns. Recent increases in the costs of construction and credit have made renovation and new construction of compliant facilities even more costly.

The impact of Proposition 12 will not be homogeneous across all hog producers. In the short run, the market will be segmented and supplies of pork in California will be constrained. This will result from a shortage of compliant pork. At the same time, noncompliant pork that once was sold in California will be relegated to the rest of the US market, depressing prices of pork everywhere except California, where pork prices will rise

substantially. Given the delays in resolving legal challenges and in enforcing the regulations, these effects will be modest. New construction will likely consider the increased space requirement in new facility designs and in the long run much of the industry is likely to become compliant with these restrictions.

As I have noted, the extent to which consumers comprehend animal welfare issues and recognize the differences across different types of livestock and production systems is unclear. More specifically, consumers may not fully understand the nuances associated with different livestock animals and their space needs. As is often the case, regulatory initiatives that are promoted by special interests may not be consistent with sound scientific evidence and the extent to which voters are able to separate emotional rhetoric from sound scientific evidence is questionable.

The costs of the restrictions are widespread and extensive. Farmers face the costs of renovation or the construction of new facilities. These costs are currently exacerbated by significant increases in building costs and the cost of credit. Farmers will face losses in productivity as they move to new production and management systems. This lost productivity will be especially acute in the short run, as the new systems are mastered. The new production systems will lead to increased stress on breeding sows, which in turn will lead to lower fertility and embryo survival rates. The industry will be required to maintain

identity preservation and market segmentations. This will involve considerable changes to the logistics of pork product distribution.

These costs will have a more severe impact on smaller, independent operations. As I have shown, these operations tend to be less efficient and have lower profit margins. Smaller operations also have less access to the credit needed to finance renovations and new construction. Thus, one important outcome of Proposition 12 will be an increase in the exit of smaller hog operations. The pork industry will become more concentrated with fewer but bigger farm operations. The stresses placed upon the entire production and marketing chain will also favor larger processors, thereby leading to ever-increasing consolidation and concentration of the industry.

This document provides a high-level summary of the expected impacts of California's Proposition 12. Much greater research is needed to address the impacts of the proposition on heterogeneous farm operations, packers, wholesalers, and retailers. More in-depth empirical research is needed to quantify the impacts of the regulations and the long-term adjustments that the industry will realize. The costs of the proposition will be significant and will impact the entire marketing chain.

**Figure 1. County-Level Counts of Hog Producing Establishments**

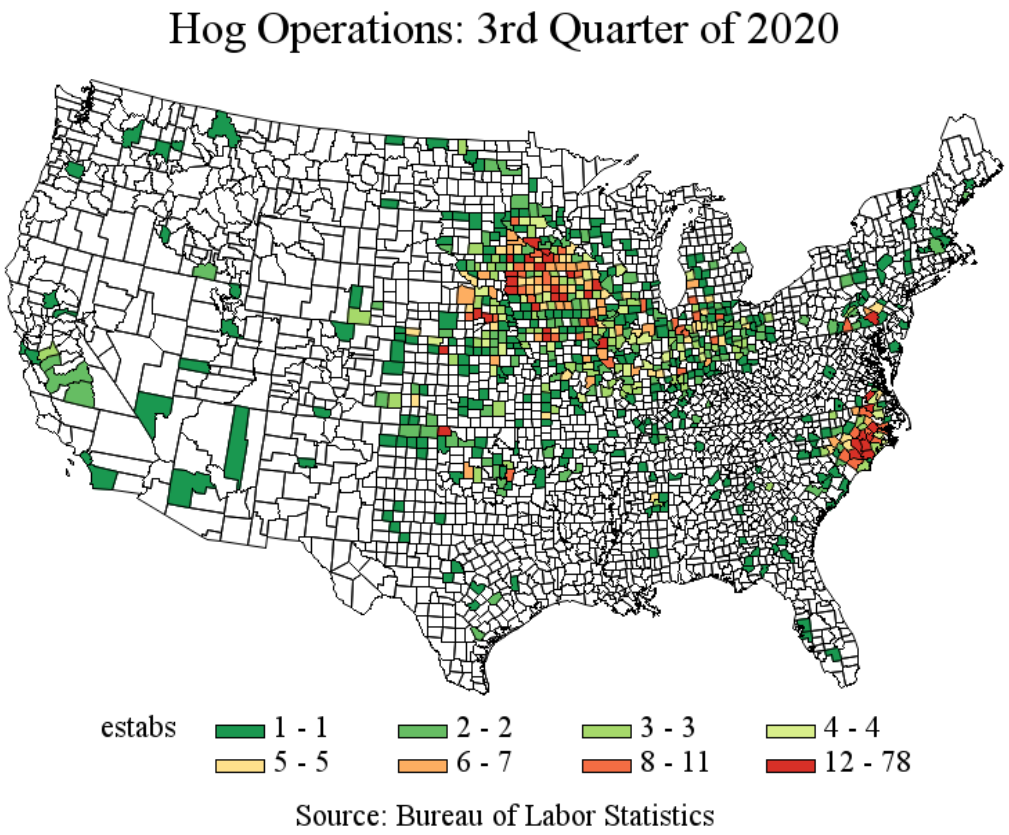
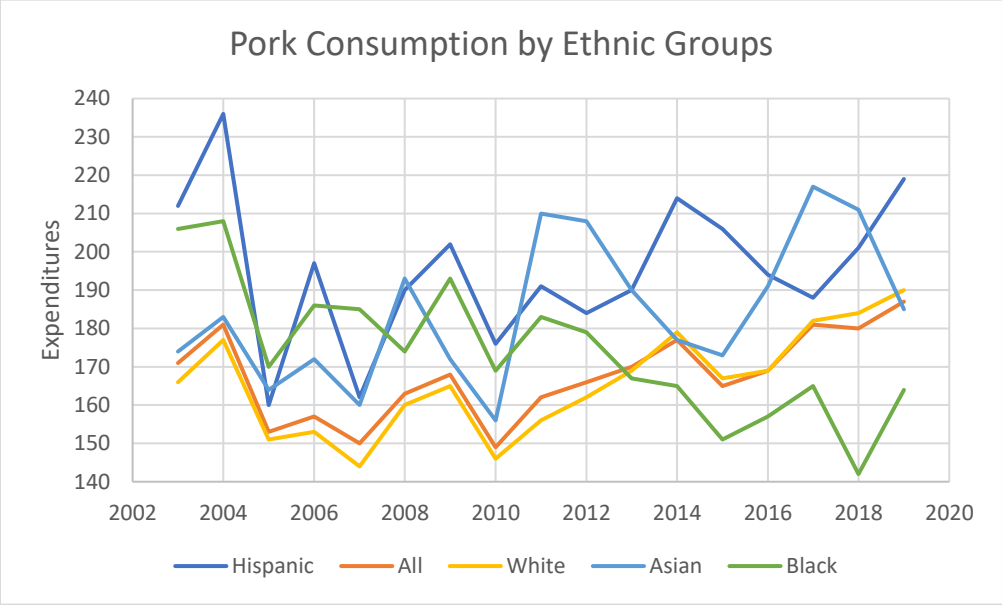
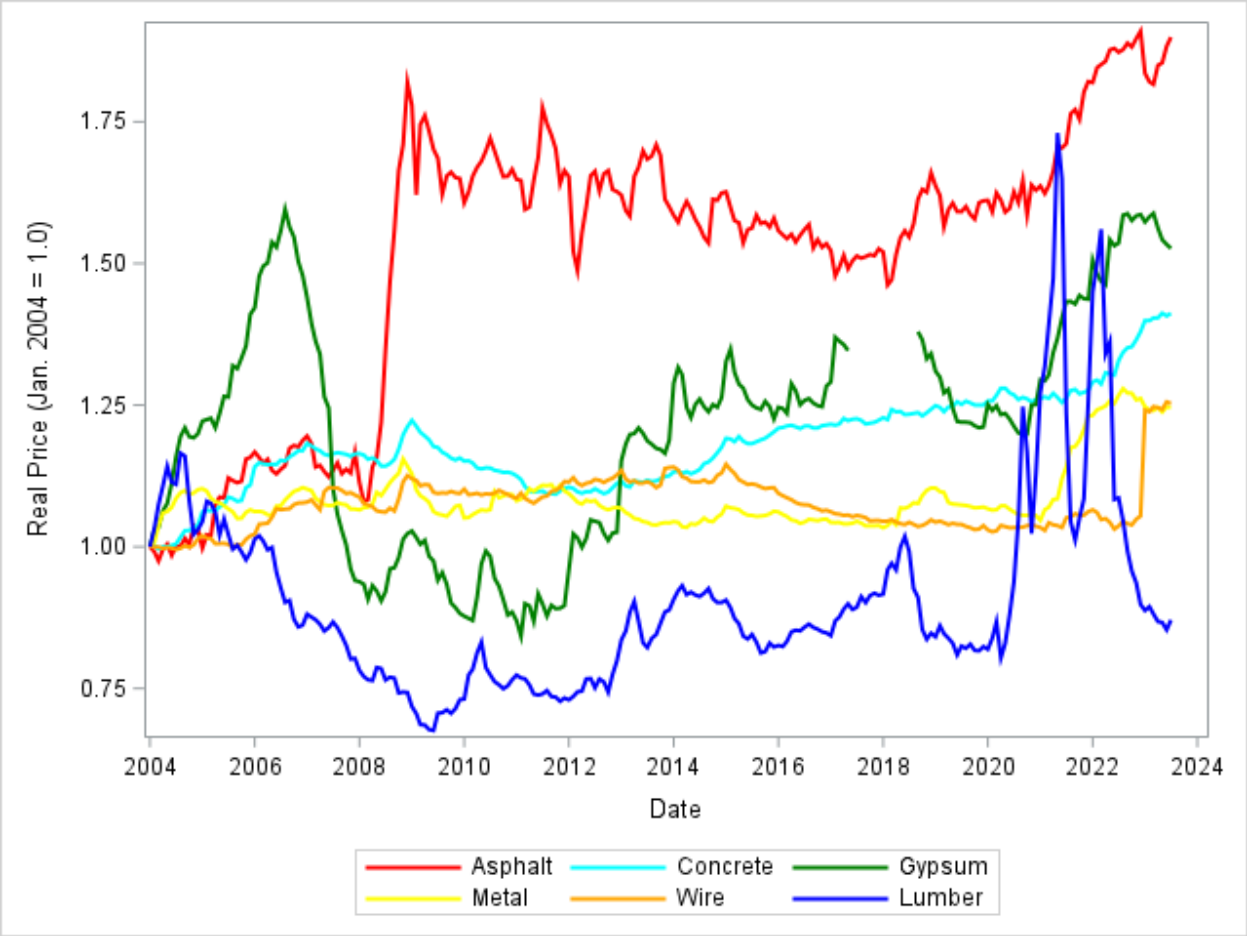


**Figure 2. Evolution of Pork Consumption by US Ethnic Groups**



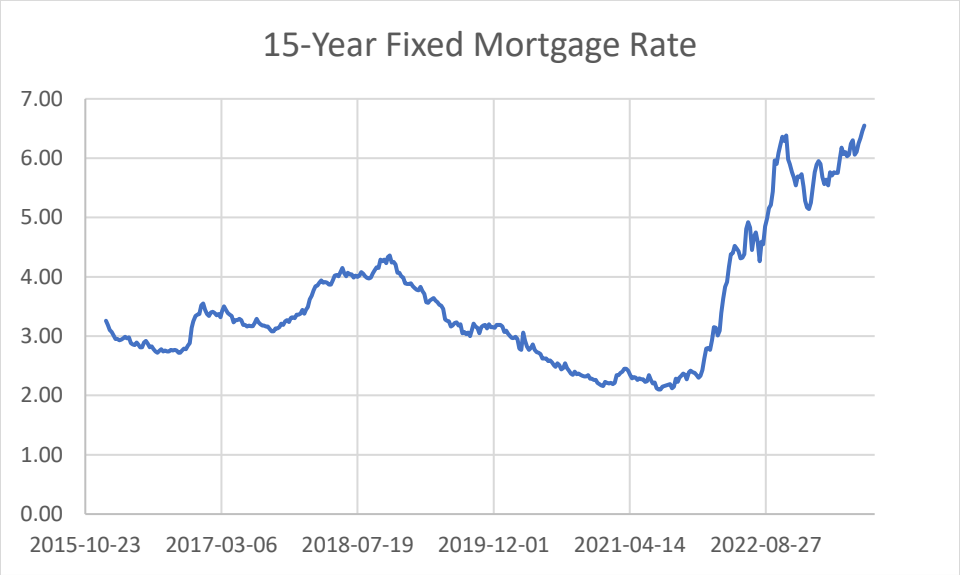

Source: US Consumer Expenditure Survey.

**Figure 3. Price Indexes of Important Construction Materials (January 2004 = 1.0)**




Source: Bureau of Labor Statistics

**Figure 4. 15-Year Fixed Mortgage Rates (Average of All US Banks)**

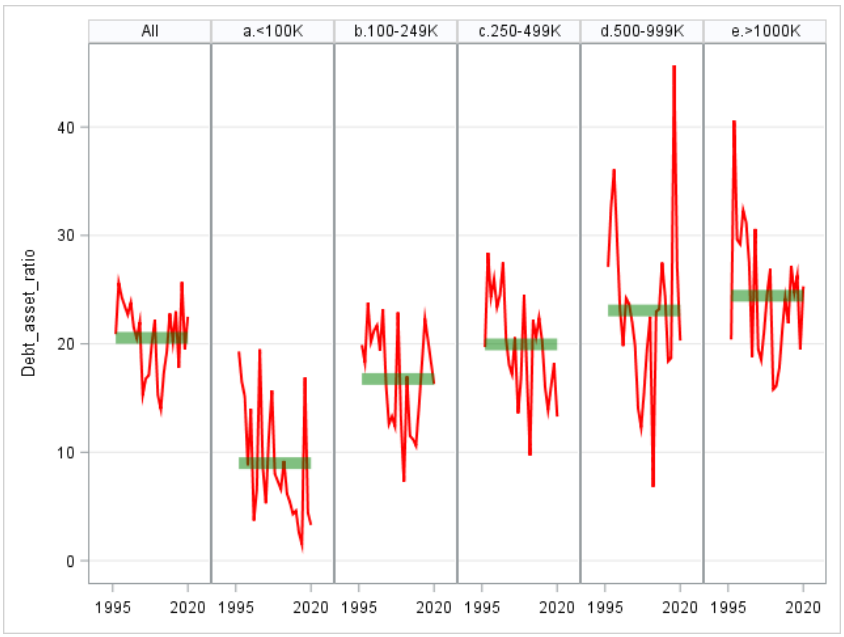



**Source: Federal Reserve Economic Data (FRED) System**

**St. Louis Federal Reserve Bank**

**Figure 5. Financial Condition Differences by Hog Farm Size (Economic Class)**

**A. Debt to Asset Ratio**

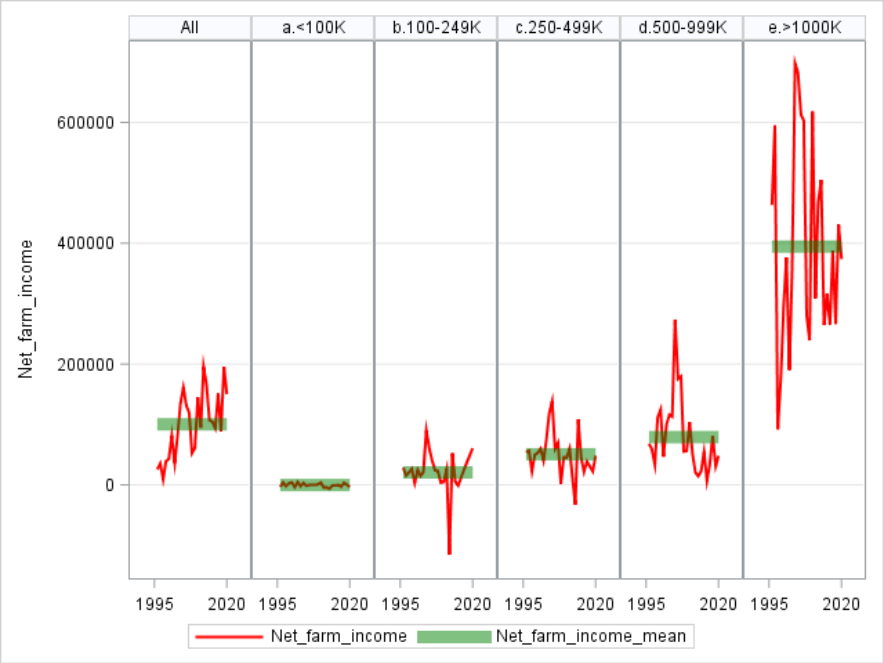



**B. Rate of Return to Equity**

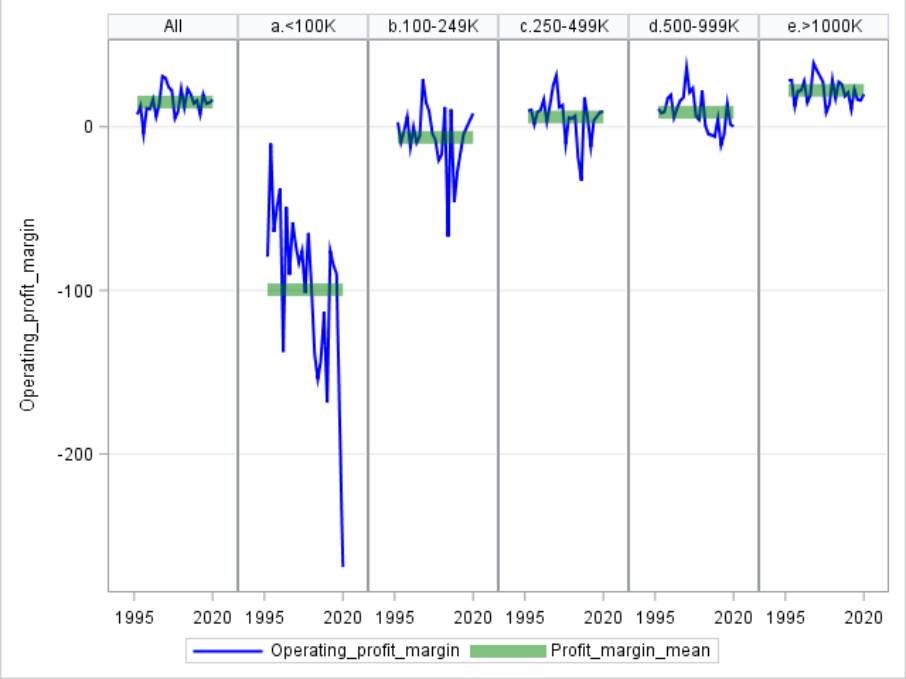

Source: Unpublished Summary Statistics from the ARMS Survey of USDA

**Figure 6. Financial Condition Differences by Hog Farm Size (Economic Class)**

**A. Net Farm Income**



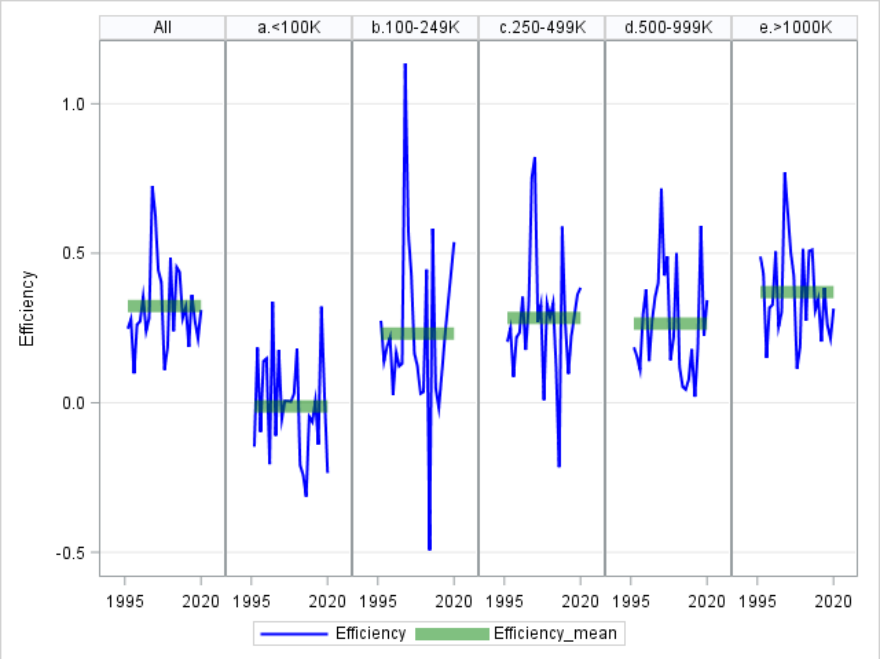

**B. Operating Profit Margin**



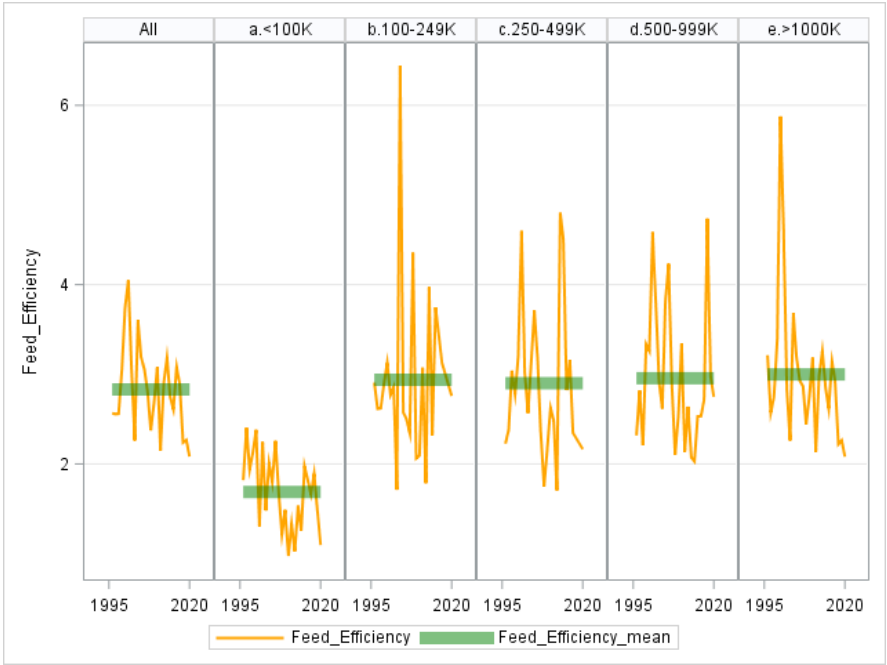

Source: Unpublished Summary Statistics from the ARMS Survey of USDA

**Figure 7. Financial Condition Differences by Hog Farm Size (Economic Class)**

**A. Economic Efficiency**




**B. Feed Efficiency**




**Source: Unpublished Summary Statistics from the ARMS Survey of USDA**