Agriculture's Shifting Political Power Base

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Abstract

This study examines the change over time in agricultural congressional market power and production concentration using the Herfindahl-Hirschman Index and concentration ratios. Results indicate that the number of congressional districts representing the production of several crops has declined substantially and that greater concentration within crop and livestock variables has occurred.

Agriculture's Shifting Political Power Base

Agricultural interests are often thought to have political power beyond what would normally be expected from a constituency of its size. As farms have historically grown larger and fewer in number, rural populations have subsequently declined, leading to larger geographic congressional districts in primarily rural, agriculturally dependent areas. Conversely, urban populations have grown in size leading to a larger proportion of urban and non-agriculturally dependent districts. Martis and Elmes indicate that the House of 2000 will be more urban and suburban in character than its predecessors, and that issues affecting the North and Midwest (important agricultural regions) will likely receive less support than those pertaining to the West and South (p. 116).

Knutson, Penn, and Boehm indicate that, based on residence of population, the House has only 71 agriculture votes, well short of the 218 votes required to pass a bill in the House (p. 45). However, they also suggest that agriculture is maintaining its base of support from both rural and urban politicians and that agriculture's political power base is not declining (p. 80). This suggests that a decline in the number of agricultural representatives may in fact have made it easier for agriculture to articulate its interests to other politicians.

Despite the considerable changes occurring in the population's demographics, little research has examined the impact of these changes on agriculture's congressional power. The objective of this study is to determine the change over time in agricultural congressional market power (market concentration). Specifically, shifts in congressional

market power will be examined in relation to agricultural commodity production levels. In addition, various concentration ratios and the Herfindahl-Hirschman Index (HHI) will be used to measure congressional market structure. In doing so, this study will determine to what extent agriculture's political power base has shifted due to redistricting and whether greater concentration within single commodities has occurred. In most studies of market concentration and power, a large concentration ratio is typically associated with greater market power by firms, however, a large concentration of agricultural production within a small number of congressional districts could indicate a potential lack of influence by this sector in that more coalition building will be required to obtain a desired outcome. Comparison of concentration measures (ratios) across decades will determine if and how market power has shifted due to redistricting and whether greater concentration within single commodities has occurred. Results should be interesting for farmers, politicians, and special interest groups, as well as researchers.

Examining Agriculture's Political Market Power

As Hinich and Munger note, politics may be the most complex and the most difficult of all social phenomena to theorize about (p. 3). Bender and Lott in a critical review on legislator voting argue that overwhelming evidence supports three conclusions that are applicable for understanding political power: 1) for the vast majority of cases, politicians are representing their constituents' interests in how they vote; 2) when politicians vote against their constituents' interests, it is usually economically trivial; and 3) even when small deviations occur in voting patterns, the politician is often quickly

removed from office.

Downs and Black adapted the spatial competition model developed by Hotelling to develop two important theoretical contributions of political theory. The first is that political power lies at the "middle" of the constituency that is effectively franchised. The second suggests that the stability of political systems is variable (dynamic) and depends on the nature of citizens' preferences, as well as the rules used to aggregate these preferences. These principles, succinctly stated by Downs and Black, have actually been found in the writings of Aristotle who recognized that citizens' world views can be ordered by their position along a single (ordered) dimension such as wealth, that the power of government is at the center of those who can vote, and that the decision to enfranchise certain groups can change the distribution of preferences.

Political scientists prior to the 1970s tried to model legislative action based on ideological motives, without examining why legislators having a certain ideology were elected or re-elected from a certain jurisdiction (Bender and Lott). The issue of economic motives of the constituency versus the ideological motives of the politician has been a debate that has received much attention since the 1971 article published by Stigler. Stigler made a convincing argument that political ideology was not important because political behavior could be explained by economic motives. This work resulted in a general process in which both economic and ideological issues are important in explaining political behavior. Ideas such as a re-election constraint, ideological consumption activity, and the spatial model of electoral competition have continued to dominate the literature regarding

political voting behavior (Bender and Lott).

Becker presented an economic theory of competition for political influence which has important findings. The first is that politically successful groups tend to be small relative to the size of the groups taxed to pay their subsidies. In addition, Becker found that a group that becomes more efficient at producing political pressure will become more successful at influencing policy.

The agricultural economics literature on political power has focused on the measurement of the political preference function (Rausser and Zusman, Gardner, Bullock), the behavioral approach used (Paarlberg), or the measurement of voting behavior (Abler, Williams, and Anderson and Hayami). Each of these studies examines voting behavior as a function of some combination of ideological and/or economic variables.

This study examines a more dynamic process regarding changes in the concentration of agricultural commodities across congressional districts. Change can occur due to redistricting and/or due to changes in production patterns. The dynamic process also may be more illustrative of changes in the constituency. Given the importance of the center in the political process (Aristotle), examining how that center has shifted over time is important to understanding gains or losses in political power over time by certain commodity groups. In addition, based on Becker's reasoning, it may be argued that as constituent interests become more concentrated, the efficiency of effort may actually increase.

Data and Estimation Procedure

Concentration in this study is based on the amount of production or inventory held by the constituents of the district. This measure differs from the measure used by Abler, who considers the number of farmers in the district as a measure of constituent interest. Total production is an appropriate measure because it more closely represents the amount of wealth potentially at risk within the congressional district. The base data for this study consist of annual time series observations of county crop production for all fifty states for the period 1972-1997.[1] Crop production data for wheat, corn, soybeans, sorghum, barley, hay, oats, cotton, and sunflowers were obtained from the United States Department of Agriculture, National Agricultural Statistics Service (USDA-NASS). County cattle and sheep data are annual time series observations for 1975-1998; poultry and hogs are for 1974-1997. All cattle and calves inventories, hog and pig inventories, and egg, milk, and wool production were also obtained from the USDA-NASS. Congressional district assignments for all fifty states for the 1970s, 1980s, and 1990s were obtained from various Congressional Quarterly, Inc. publications. Each county in each state was assigned to a specific congressional district, and the agricultural data were aggregated to the congressional district level by commodity.

Congressional reapportionment (the redistribution of the 435 House seats among

[1] The crop and livestock data reported by USDA-NASS are not always at the county level. Therefore, in some cases, certain counties enter and exit the sample. This usually occurs in those states where production or inventories do not constitute a large amount of production, or where funding for data collection is limited.

the states) and redistricting (the drawing of legislative district boundaries) occur every ten years on the basis of the decennial population census. Agricultural data were averaged by congressional district over the same ten year periods, and the percentage of crop production and livestock inventories or production was determined. This allowed congressional market power to be examined on a decennial basis for three time periods. These periods were 1972-1981, 1982-1991, and 1992-1998. When data were not available for the entire time period, the available annual values were averaged.

Market power was measured and compared for the three decades using the Herfindahl-Hirschman Index (HHI) and several concentration ratios. The HHI measures market concentration as a function of the individual congressional districts' market shares and is calculated for each ten year period as follows:

(1) $$HHI \quad \sum_{i\ 1}^{n} S_i^2 \quad ,$$

where S_i is the market share of the *i*th congressional district, and *n* is the total number of districts.

A four-district concentration ratio (CR4) was used to measure the share of total agricultural activity accounted for by the top four districts. A 25-district ratio (CR25) and a 218-district (CR218) ratio, which are, respectively, based on the number of members of the House Agriculture Committee required to pass legislation and the number of votes required to pass a bill in the House, were also examined. The concentration ratios are

given by:

$$\textbf{(2)} \qquad CR4 \quad \sum_{i\ 1}^{4} S_i \quad , \qquad CR25 \quad \sum_{i\ 1}^{25} S_i \quad , \qquad CR218 \quad \sum_{i\ 1}^{218} S_i \quad ;$$

where S_i is the market share of the ith congressional district and i=1 is the congressional district with the largest market share, i=2, the second largest market share, and so on.

Empirical Results

Table 1 presents the HHI and concentration ratio values for the production of nine crops. HHI results indicate that sunflowers is the crop which is most concentrated in production with barley being the second most concentrated. Corn and hay exhibit the least amount of production concentration of the crops examined. HHI results further show sunflower, cotton, and hay production have become less concentrated over the last three decades while the production of all other crops has become more concentrated within fewer congressional districts. Sunflower production exhibits the largest change in concentration with an 8.3% decrease from the 1970s to the 1990s, while barley has the second largest change with a 7.3% increase in concentration.

CR4 results (Table 1) indicate that nearly 90% or more of sunflower production occurred in only 4 congressional districts for all three decades. Wheat, sorghum, cotton, and oats have over 30% of production concentrated in 4 districts while barley has nearly 50% or more for all 3 decades and has approached 70% in the 1990s. Corn, soybeans, and hay generally have between 12-25% of production located in the top 4 crop producing

congressional districts.

CR25 results indicate that all crops have roughly 50% or more of production occurring in 25 or fewer congressional districts for all three decades. Sorghum, barley, cotton, and sunflowers have more than 83% while wheat, soybeans, and oats have more than 60% of production located in 25 or fewer districts. The concentration of corn in the top 25 districts has increased over the three decades from 51% to 64% while that of hay has decreased from 84% to 48%. CR218 results indicate that all crops for all decades have at least 99% of production occurring in 218 or fewer congressional districts.

The final column of Table 1 reports the number of congressional districts that represent 100% of the production as reported by USDA. Over three decades, the number of congressional districts with wheat, corn, sorghum, and barley production has decreased by 20, 8, 74, and 120, respectively. The number of districts with soybeans, cotton, and oat production has remained relatively constant over this period. Based on the work by Aristotle, Downs, and Black this would suggest that the "middle" has shifted quite substantially in these commodities. For example, the middle for any sorghum constituency has potentially shifted from 178, roughly 41%, to 103, roughly 24%.

Table 2 presents the HHI and the concentration ratio results for livestock inventories and various livestock-related commodity production. HHI results indicate wool production is the most concentrated with egg production being second. Cattle inventories and milk production exhibit the least amount of concentration of the livestock variables examined. HHI results also indicate wool production has become less

concentrated, milk production concentration has remained nearly constant, and all other livestock variables have increased their concentration over the last three decades. The largest shift in concentration occurred in wool production, with the HHI decreasing by 23.4%. Milk production and livestock inventories had very small changes in the HHI.

CR4 results (Table 2) indicate that for all three decades nearly 85% or more of wool production and over 75% of egg production occurred in only 4 congressional districts. Milk production and hog and pig inventories are less concentrated with roughly 19-25% of activity located in 4 districts. Cattle and calf inventories generally had only 12-15% of inventories located in the top 4 congressional districts.

CR25 results indicate that all livestock variables have roughly 40% or more of activity occurring in 25 or fewer congressional districts for all three decades. All wool production is located in fewer than 25 districts, while 94% of egg production occurs within 25 districts. Nearly 65% of milk production and hog and pig inventories are concentrated in 25 or fewer districts. Cattle and calf inventories exhibit the least amount of concentration of the livestock variables with over 40% of inventories located in the top 25 districts. CR218 results indicate that all livestock variables for all decades have at least 98% of activity occurring in 218 or fewer congressional districts. Over the last three decades, the number of congressional districts that make up the total of reported livestock inventories or production has changed very little compared to that of crop production.

Conclusions and Implications

The distribution of the U.S. population has changed considerably over the past few

decades, and because of this so has the size and shape of the 435 House Congressional Districts. Such changes theoretically could have substantial impacts on the making of agricultural policy. This study has examined the concentration of agricultural activity in congressional districts to determine to what extent market concentration (market power) has shifted due to congressional redistricting and whether greater concentration within single commodities has occurred. Results of several measures of market concentration over the last three decades for various crop and livestock activities indicate that crop production for wheat, corn, soybeans, sorghum, barley, and oats has become more concentrated. Only sunflower, cotton, and hay production have experienced decreases in concentration. Likewise, three of five livestock variables examined exhibit increasing congressional district concentration. In addition, the number of congressional districts that represent any wheat, corn, sorghum, and barley production has declined substantially. A larger concentration of specific production in few congressional districts points to the fact that some representatives have increased incentives to serve as "players" in the policy arena.

Certainly, continued research is necessary to more fully examine the effects of changing demographics on agriculture's constituent concentration and market power. Extensions of this research will include examining additional decades, examining additional crop and livestock variables, examining the House Agriculture Committee including the members of it and how much and what agricultural variables they control, decomposing changes between the redrawing of boundaries and shifting production patterns, and examining state or regional concentrations.

Table 1. Herfindahl-Hirschman Indices and Concentration Ratios for Crop Production by Decade*

Crop)) Decade	HHI	CR4	CR25	CR218	CDs
Wheat)) 1970s	4.5%	35.1%	73.6%	99.7%	291
Wheat)) 1980s	4.4%	33.5%	73.8%	99.7%	284
Wheat)) 1990s	5.7%	39.3%	80.2%	99.8%	271
Corn)) 1970s	1.5%	12.5%	51.2%	99.7%	287
Corn)) 1980s	1.6%	13.4%	54.8%	99.6%	293
Corn)) 1990s	2.2%	19.2%	63.5%	99.8%	279
Soybeans)) 1970s	1.9%	16.2%	58.7%	100.0%	208
Soybeans)) 1980s	2.2%	19.6%	61.7%	100.0%	222
Soybeans)) 1990s	2.5%	20.1%	67.3%	100.0%	209
Sorghum)) 1970s	5.5%	36.4%	89.5%	100.0%	178
Sorghum)) 1980s	6.0%	38.5%	85.2%	100.0%	157
Sorghum)) 1990s	9.4%	45.9%	90.6%	100.0%	103
Barley)) 1970s	8.2%	48.5%	87.9%	99.9%	251
Barley)) 1980s	10.7%	53.6%	92.6%	100.0%	166
Barley)) 1990s	15.5%	67.5%	93.6%	100.0%	131
Cotton)) 1970s	5.4%	38.1%	88.9%	100.0%	93
Cotton)) 1980s	5.2%	35.8%	88.2%	100.0%	86
Cotton)) 1990s	4.3%	32.4%	83.5%	100.0%	93
Hay)) 1970s	)))	)))	)))	)))	)))
Hay)) 1980s	1.2%	12.5%	44.5%	100.0%	225
Hay)) 1990s	1.4%	14.9%	48.4%	100.0%	213
Oats)) 1970s	4.2%	34.2%	76.8%	100.0%	204
Oats)) 1980s	4.6%	35.1%	69.0%	99.9%	241
Oats)) 1990s	4.8%	35.8%	69.9%	100.0%	200
Sunflowers)) 1970s	37.9%	92.8%	100.0%	100.0%	17
Sunflowers)) 1980s	40.5%	89.8%	100.0%	100.0%	22
Sunflowers)) 1990s	29.6%	92.0%	100.0%	100.0%	18

* HHI is the Herfindahl-Hirschman Index; CR4, CR25, CR218 are 4, 25, and 218 congressional district concentration ratios, respectively; CDs is the number of congressional districts comprising 100% of U.S. crop production for that crop.

Table 2. Herfindahl-Hirschman Indices and Concentration Ratios for Livestock Inventories and Related Commodity Production by Decade*

Crop))	Decade	HHI	CR4	CR25	CR218	CDs
Cattle))	1970s	1.1%	12.6%	40.9%	98.6%	295
Cattle))	1980s	1.2%	14.3%	42.8%	98.1%	305
Cattle))	1990s	1.3%	15.3%	43.8%	98.3%	300
Hogs))	1970s	2.2%	20.1%	61.4%	99.8%	270
Hogs))	1980s	2.4%	21.2%	64.6%	99.8%	277
Hogs))	1990s	2.8%	25.1%	66.9%	99.8%	274
Eggs))	1970s	24.9%	76.7%	93.3%	100.0%	92
Eggs))	1980s	23.4%	77.9%	93.8%	100.0%	90
Eggs))	1990s	27.3%	78.9%	94.3%	100.0%	88
Milk))	1970s	2.4%	20.7%	65.6%	100.0%	177
Milk))	1980s	2.3%	19.3%	65.4%	100.0%	176
Milk))	1990s	2.3%	19.1%	65.3%	100.0%	176
Wool))	1970s	47.0%	89.0%	100.0%	100.0%	14
Wool))	1980s	36.8%	87.8%	100.0%	100.0%	15
Wool))	1990s	23.6%	84.1%	100.0%	100.0%	16

* HHI is the Herfindahl-Hirschman Index; CR4, CR25, CR218 are 4, 25, and 218 congressional district concentration ratios, respectively; CDs is the number of congressional districts comprising 100% of a particular market.

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