The Impact of IP on Agricultural Markets – Case Study in the Hop Industry

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Abstract - **The rapid rise in the popularity of craft beer between 2010 and 2020, which resulted in global hop acreage growth, was known as the "Craft Revolution" by members of the U.S. hop and brewing industries. Craft beer brewing methods contrasted with the traditional recipes and practices of the macro breweries. In the quest for new flavors, craft brewers increasingly relied upon intellectual property (IP) in the form of proprietary hop varieties. As they incorporated the names of proprietary varieties into their marketing efforts, brewers relied upon access to these new varieties for their success. We calculated the increased market share for proprietary varieties relative to public varieties in the U.S., and the market share of the five largest companies that owned proprietary hop varieties. The latter revealed that one company owned varieties planted on 50% of U.S. acreage. Using these data and the Herfindahl-Hirschman Index (HHI), we analyzed the change in industry competitiveness between 2000-2020 and its result on pricing.**

INTRODUCTION

The companies developing proprietary hop varieties benefited from the unprecedented and rapid rise of the U.S. craft beer industry between 2010 and 2020. They could not have foreseen such a development when they began their programs. They were, however, well positioned to take advantage of the change and benefited from a first mover advantage. Licensing agreements of intellectual property (IP) facilitated the management of supply by a concentrated group of individuals. It would be unreasonable to assume these individuals would manage production of their IP in a way that would be financially disadvantageous to them or the companies they own. These individuals own entities that produce hops and those that market hops in addition to the entities that develop new varieties. Their production and marketing entities have benefitted from sustained high prices as have the third-party growers who produce them on contract. It is reasonable to assume IP owners would manage their IP in a way to encourage sustained premium pricing, and lower price variance. Due to the inelasticity of hop demand, a deficit would produce such conditions while creating the urgency to contract.

MATERIAL AND METHODS

Using U.S. hop industry data and the Herfindahl-Hirschman Index (HHI), we were able to calculate the change in competitiveness over time as the proportion of proprietary varieties grew relative to the quantity of public varieties. The HHI is useful for evaluating changes in the competitiveness within a single industry over time or comparisons of one industry to another since it can be interpreted as a number equivalent (Calkins, 1983). It decreases as the number of firms in the market increases (Depken, 1999). The HHI is responsive to asymmetry of market shares. For any number of participants in a market, the HHI will be lowest when market shares were equal, and highest when one firm has an extremely large share of the market (Calkins, 1983).

We proposed that by calculating the market share for each variety and by grouping those varieties together by ownership the market share of the entities involved in variety development could be calculated. The market share of these entities could then be calculated using the HHI to determine the degree of competitiveness within the proprietary market. We took this calculation one step further to consolidate the effect on competitiveness of branded proprietary varieties as a whole relative to public varieties. Branded proprietary varieties were products enjoyed monopoly control. They were governed by few individuals. Public varieties were available for any grower to produce. The contrast was stark enough to warrant a calculation comparing the two and that that calculation was representative of the direction of competitiveness within the market.

A potential drawback of the HHI according to Calkins (1983) is that small errors in estimating a firm's market share can produce large errors in the HHI. It was essential to keep this in mind when designing the parameters of any analysis.

The formula for the HHI is as follows:

The HHI Formula $HHI = S1^2 + S2^2 + S3^2 + \ldots Sn^2$

Where:

N refers to the number of firms in the market

S1, S2, etc.… - refers to the percent market share each firm holds.

RESULTS

We determined the market share of acreage in production an individual or entity could influence to be of greater impact on the market than the market share of sales of an individual or merchant. Concentration of control over a volume of hops, referred to as "one-desk selling" when it pertained to sales to breweries, was of equal or greater value when applied to production. This concentration combined with the complex monopoly structure of the industry reduced price competition between independent producers and sellers via licensing agreements.

Acreage, and the infrastructure necessary to harvest that acreage, was a more scarce and valuable resource in the hop industry in 2020 than the hops themselves. It was the asset for which there was the greatest competition. The primary method for harvesting hops was via fixed picking machine facilities. Yields of hops for the most popular

proprietary varieties of 2020 were not higher than public aroma varieties. Their alpha acid yields, however, were significantly higher than public aroma varieties making them dual-use varieties – which is a designation meaning that a variety may be used for its aroma or its alpha characteristics.

Increased alpha acid levels also enables more cost-efficient extraction of surplus proprietary aroma hop production.

The calculations produced an HHI value for each public variety acreage relative to the total U.S. acreage for the years 2000 through 2020. Another calculation produced an HHI for each public variety production relative to total production for the years 2000 through 2020. There were calculations for each proprietary variety acreage relative to total U.S. proprietary acreage for the years 2000 through 2020 The sum of U.S. branded proprietary varieties relative to the sum of U.S. public varieties was calculated and graphed for the years 2000 through 2020 for acreage (Figure 1).

DISCUSSION

The HHI calculations made in this research offered a glimpse of potential company market share with regards to branded proprietary varieties. Those same companies used their position to leverage demand for proprietary to encourage sales of public varieties. It was beyond the scope of this research to evaluate whether this type of behavior existed, but anecdotal evidence we gathered suggested it existed. The extent to which such behavior existed could not be confirmed and was beyond the scope of this research. Influence extends beyond the branded proprietary varieties themselves. It was reasonable to extrapolate the market share of the merchant companies that share ownership with the entities that developed branded proprietary variety market share and assume that same level of influence applied to public variety market share.

The results of such analyses can yield useful insights into the reasons for industry behavior concluded Rhoades (1995) who stated that markets with relatively high levels of the HHI, market share inequality, and the presence of major firms were imperfectly competitive and that market imperfections were ultimately exploited.

Competitiveness and the level of concentration within an industry have obvious impacts upon price. Price cost margins were lower in markets with lower concentrations.
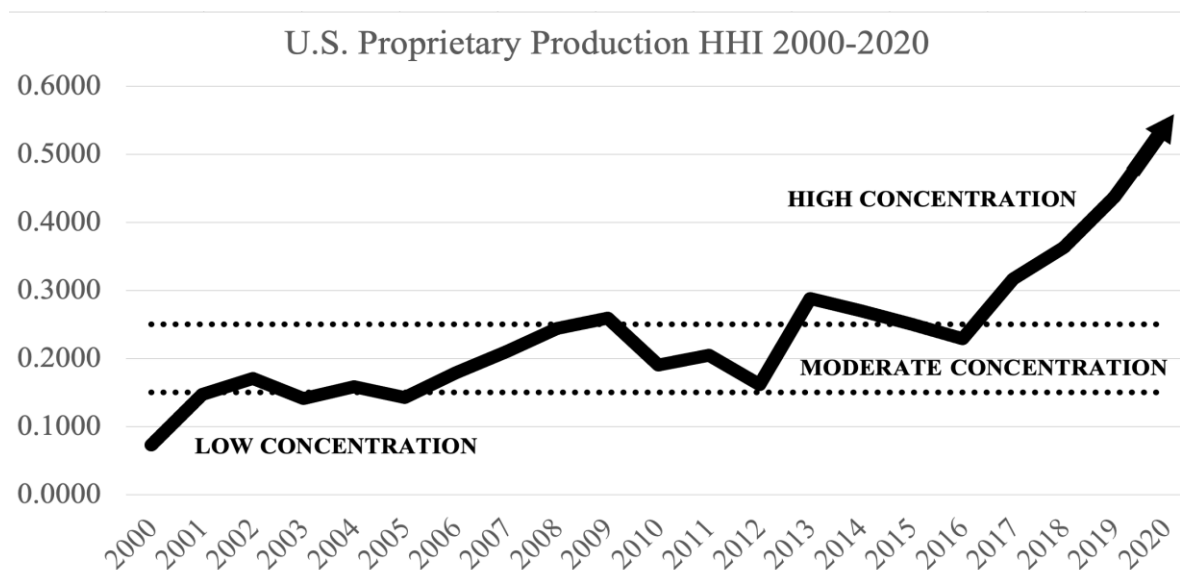

Figure 1: HHI for U.S. proprietary variety acreage 2000-2020.

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