# Nocke and Schutz (2019): A Review

Mason Ross Hayes

2022-03-28

## 1 Introduction

Nocke & Schutz (2019) analyzes horizontal mergers in a model of multi-product price competition (differing from past literature on primarily single-product and homogeneous goods a la Cournot). The aim of this paper is to provide a framework for analyzing the dynamics of mergers in a multi-product market.

One of their primary findings is that the rise in price index following a merger is roughly linear in the *change in* the HHI, denoted as $\Delta HHI$, following the merger. Moreover, it is a function of the number of products in the market, and consumer surplus and total surplus are functions of firms' market shares in equilibrium.

They use a model similar to that of BLP (1995), with two cases: a nested constant elasticity of subsitution model (NCES), and a nested multinomial logit model (NMNL). Quality and marginal cost can vary arbitrarily, but a key assumption of the model is that each nest is owned by a single firm, implying that firms compete *across* nests, not within nests.

This assumption is important as it allows the model to be formulated as an aggregative game, which is a key component of the model. These assumptions also allow for *type aggregation*: all information about a firm's product portfolio is aggregated into a one-dimensional sufficient statistic. One advantage of this type aggregation property is that it allow potential synergies to take many different forms: merged firms' marginal costs or qualities may go up or down, and new products can be introduced or old products retired from the market. Any of these potential effects can occur alone or all together and are entirely reflected in the firm's post-merger type.

The authors show that there exists a cutoff post-merger type above which CS increases following the merger, and respectively decreases if the firm's post-merger type is below the cutoff. The authors also show that the firm's post-merger type is a function of the firm's market share in equilibrium (?).

## 2 The Oligopoly Model

The assumption that firms compete across nests is a fundamental assumption of the model; however, it seems more natural to think of the nests as a collection of imperfectly substitutable products in some category, and that firms compete both across and within nests. For example, if a consumer is in the market for a beverage, it seems reasonable to assume

that she chooses first what type of beverage she wants (soda, juice, or water, say) and then chooses what brand of beverage she wants. For example, the model of the paper would imply that soda from Pepsi is a closer substitute to juice from Pepsi than is soda from Coca-Cola. The authors make this assumption for tractability, but the assumption also has a direct impact on firm's strategic price-setting decision.

For the purposes of this short review, I will look only at the NMNL model. In this model, the economic environment can be summarized by the tuple corresponding to the number of (imperfectly substitutable) products N, number of nests L, number of firms F, product quality and product marginal cost: $(N, L, F, (\alpha_j)_{j\in N}, (c_j)_{j\in N})$, with nest parameter $\beta$ and elasticity parameter $\lambda$. When $\beta < 1$ (i.e. when the nesting matters), the authors note that:

> "firm $f$ internalizes self-cannibalization effects within its own nests, and it optimally sets a Lerner index that exceeds that in the absence of nests (p. 9, Nocke & Schutz, 2019)"

This behavior would not be the same if products were nested by category and not by firm. The first order condition of profit maximization for product $i$ in nest $n$ of firm $f$ is given by:

$$\frac{p_i - c_i}{p_i}\frac{p_i h_i''}{-h_i'} = 1 + (1-\beta)\frac{\sum_{j\in n}(p_j - c_j)(-h_j')}{H_n}$$

where $H_n$ is the nest-level aggregator; so when $\beta < 1$, the firm accounts for the nest-level self-cannibalization effects. Nocke and Schutz (2019) call the left-hand side of this equation the $\iota$-markup on product $i$; under NMNL demand, this $\iota$-markup is the same for all products in and across nests, $\tilde{\mu}_n = \frac{1}{1+\beta} \equiv \mu^{\text{mc}}$, and absolute markup $p_i - c_i = \frac{\lambda}{\beta}$ under monopolistic competition.

### 2.1 Under Oligopoly

Under oligopoly, firm $f$ has $\iota$-markup that is equal to the monopolistically competitive $\iota$-markup $\tilde{\mu}_n$ multiplied by a *market power factor* $\mu^f = \frac{1}{1-s^f}$:

$$\tilde{\mu}^f = \mu^{\text{mc}}\mu^f$$

so that the firm $f$'s markup under oligopoly is increasing in its market share. Furthermore, firm $f$'s profit $\Pi^f$ is linear and increasing in its *market power factor*: $\Pi^f = \mu^f - 1$. Firms are more likely to set a higher markup and gain a higher market share when they are of higher type or in a less competitive market.

$T^f$ is the firm $f$'s type. As $T^f$ increases (as synergies increase), firm $f$'s equilibrium markup, market share, and profit also increase; other firms' equilibrium markups, market shares, and profits respectively decrease, and consumer surplus and total surplus increase.

## 3 Modeling Mergers

A merger involves synergies if the merged firms' post-merger type $T^M$ is greater than the sum of their pre-merger types: $T^M > \sum_{f\in M} T^f$.