

Quota Market Structure and Operation and the Value of the New Zealand Fisheries: Empirical Evidence and Policy Implications

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Fisheries worldwide continue to suffer greatly from the negative consequences of open access, despite numerous regulatory “solutions”. In 1986, New Zealand responded by establishing the most comprehensive market-based system for fisheries management, resulting in the creation of currently more than 150 “fish stock markets” differentiated by geographic region and species.

Numerous articles have assessed the operation of the policy over the years (see for example Shallard (1996) Batstone and Sharp (1999), Clark and Major (1988), Pearse (1991), Sissenwine and Mace (1992) Boyd and Dewees (1992), and Annala (1996)). However, there has been very little empirical economic analysis of the markets (for exceptions see work by Batstone and Sharp (2000) and Connor (2000)). Our previous paper (Straker and Kerr 2002) gives a more detailed discussion of the New Zealand literature and more complete list. There has been more empirical literature internationally but even there it is sparse and they struggle with limited datasets (e.g.: Weninger, Q. (1998), Squires, D., M. Alauddin, and J. Kirkley. (1994) as well as those discussed in specific sections below). We aim to address this gap in the literature.

GENERAL OVERVIEW OF RESEARCH METHODOLOGY

We will use a combination of theoretical economic and bioeconomic models of fisheries to derive empirical hypotheses. We will draw on the fisheries literature but also the literature on industrial organisation and market microstructure. We will test these hypotheses using a combination of parametric and non-parametric econometric (statistical) techniques.

The results will be presented in the form of a series of papers. Many of the objectives are related. Different objectives and milestones may be addressed within one larger paper where this is appropriate.

Database available at Resources for the Future / Motu

We now have an extensive database set up in an easily usable, integrated and documented way. This database was created with financial support from Resources for the Future (RFF, Washington DC) and considerable help from the Ministry of Fisheries, Fishserve, NIWA, Clement Associates and Seafic.

Data we have:

- Lease & sale price data, per trade 1986-1998
- Quota Holdings, each holder 1987-1999

- Quota Transactions, by trade 1986-1998
- TAC levels, 1986-1998
- TACCs and actual catch, by fish stock 1986-2000
- Catch-Effort, September 1997 and April 1998
- Port price data, by fish stock 1998-2000 (currently seeking more)
- Export prices, by month 1983-1998
- Resource rental, by fishery 1986–1994
- Cost recovery levies, 1994-2001

Other Relevant data held by Motu

Motu, jointly with the New Zealand Treasury, has created a regional economic database that builds on the Statistics New Zealand Population Census data. The database contains data from 1986 – 1996 (now adding 2001) and includes most Census information as well as some additional variables. The data is available in fully documented GIS format and we have permission from Statistics NZ to provide the dataset to other researchers. We have an ongoing research programme that is using and developing these data to understand the impacts of economic change on communities.

These data can be used to identify the socioeconomic conditions relevant for different fishing management areas. We also have the GIS capability to take NIWA maps on the actual location of fish stocks within management areas and use those in electronic form.

The major database will continue to be managed by Resources for the Future. They will provide database support to Motu particularly in the second half-year.

Specific Objectives

- 1. Understand what drives quota lease prices across time and species.**

Methodology

This work will draw on economic literature relating to a range of lease markets, in particular those for oil, timber concessions and agricultural land (Alston (1986), Feldstein (1980) and Falk (1991)) as well as some previous work in the fisheries literature (eg: Brod and Shobe (1996)). These provide a theoretical basis for the drivers of lease prices. We will combine this with specific information about the costs and revenues from fisheries to generate hypotheses about how lease prices would be expected to change over time.

We will develop a database of monthly average lease prices for all fish stocks over time and link those prices to data on explanatory variables. This panel of data will then be used to explore the patterns of lease prices descriptively and to test the hypotheses using a variety of parametric and non-parametric econometric tools.

- 2. Understand the relationship between quota prices and lease prices and why the relationship between quota prices and lease prices differs across fish stocks.**

Methodology

This paper will draw on the literature used in objective 1 as well as the theoretical literature on asset prices (Hotelling and the Finance literature). The literature relates to a range of asset markets including those for wine, art and agricultural land. Another literature has investigated the relationship between lease and asset prices (eg: Robison et al (1985)). From this literature we will develop testable hypotheses.

We will supplement the dataset developed in objective 1 by linking lease prices to quota prices, and adding measures of market concentration (from Objective 3) and interest rates. We will then test the hypotheses derived from the literature. Preliminary analysis suggests that the market as a whole behaves roughly as expected but we have not yet explored the variability in these relationships across species and time.

3. Identify the extent of changes in concentration of quota ownership, the causes of changes across time and the differences across fish stocks

Methodology

This objective has two components. The first is creating measures of concentration and identifying the patterns across fish stocks and time. We will use two basic measures, the Herfindahl Index and the m-firm concentration ratio (for discussion of concentration measures see Tirole (1988) pp 221 – 223). This component requires cleaning up data on quota ownership so that each 'owner' is truly a separate company / individual rather than the same entity simply registering with a different name. Most of this work has been completed already. Then the data needs to be analysed to find meaningful ways to represent the concentration. We will draw on literature such as Ekelund et al (2000).

The second component is to understand the causes, and to a lesser extent implications, of differences in concentration. Concerns about the effects of monopoly in tradeable permit markets have been discussed in Hahn (1984), Misiolek and Elder (1984) and, specifically for fisheries, Anderson (1991). We would explore whether the conditions necessary for problems with monopoly power exist in New Zealand Quota Markets. One benefit of concentration is the ability to effectively vertically integrate the fisheries industry. For example a large processing plant or major exporter might want to control quota so that they can control their flow of inputs. Previous research on these issues, not necessarily in the fisheries of tradeable quota area, includes Adelaja and Menzo, et al. (1998), Adelaja, Menzo and Bonnie (1998), Kranton and Minehart (2000) and Fan (2000). Finally, another potential advantage of concentration of quota is that the owners have an enhanced incentive to protect the resource. The QMS system controls many things but some are still flexible and could potentially be managed better under a single manager (See for example, Adelaja and McCay (1998)).

To analyse this component we will draw extensively on the existing literature, develop clearer theoretical models and use a variety of descriptive statistics to explore the importance of these issues in the New Zealand context.

4. Identify the levels of liquidity in the quota markets and explore differences in liquidity across time and fish stocks.

Methodology

This objective again has two goals. The first is to simply document levels of liquidity measured in terms of numbers of trades or leases and numbers of owners. Liquidity can also be measured indirectly through measures of price dispersion and price stability (Joskow, Schmalensee, and Bailey 1999).

The second goal would be to explore the causes of different levels of liquidity and to assess in a qualitative way the likely implications of low levels of liquidity in some markets.

5. Understand the effects of bycatch relationships on quota prices.

Methodology

Because some species are caught jointly, fishers who want to catch one must own quota for the other. This means that the prices of the two quota are related. We plan to test this idea using a broad database that identifies bycatch relationships in general but also in two specific instances where the bycatch relationships are clear and simple. Previous literature on the economics of bycatch includes Boyce (1996), Larson et al (1996 and 1998), Neher (1988) and Squires and Kirkley (1995).

We will use observer and catch/effort data to give the relationship between hoki and hake catches and bluenose and alfonsino catches respectively. These offer simple 'natural experiments' where the level of bycatch varies across space and time and we can study the effect of this variation on the relationships between the quota prices.

We will first develop a more formal model of the joint determination of prices. We will use this to develop testable hypotheses about price paths and relationships. Then we will develop the datasets on bycatch intensity and link those to our other data on quota lease prices and their determinants. Finally we will test our hypotheses.

6. How do catch patterns respond to changes in international prices for different species and fish products?

Methodology

Two advantages of ITQ systems is that they provide fishers with flexibility about when to catch fish and more security to invest in equipment that allows more valuable products. If fishers take advantage of these opportunities it should show in their catch behaviour. As international prices for certain species and products change over time, catch patterns should also adjust.

We will extend our data (the extent of the extension will depend on the ready availability of relevant data in usable form), develop clearer models of the expected responses of fishers and then explore / test the hypotheses that arise from these models.

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