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Individual Transferable Quotas Allocation in Icelandic Fisheries: a Community-Oriented Inequality Analysis

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Since 1990, management of the Icelandic fisheries has been based on the Fisheries Management Act and its subsequent amendments. The main objective of the Act is to promote conservation of the exploitable marine stocks and their efficient utilization, thereby ensuring stable employment and settlement throughout Iceland, (Althingi, 2006).

Increase in efficiency has been brought about through the introduction of an individual transferable quota (ITQ) system. As expected, the fishing fleet, both the number of vessels and total tonnage, has decreased since the introduction of the quota system, while the profitability of the harvesting sector as a whole has improved. Several studies also indicate that productivity has increased in the fisheries (Arnason, 2003; Eggert and Tveteras, 2013). From a macroeconomic perspective, the impact of the quota system has therefore been quite positive. Indeed, the OECD has praised these positive impacts in almost every report on the status of the Icelandic economy since at least 1997 (see for instance OECD, 1997, 2009, 2013).

The aims to maintain stable employment and settlement throughout the country have, however, proved more troublesome. Here, the toolkit has mostly consisted of discretionary measures, such as allocating extra quotas (*byggðakvóta*) to firms in especially vulnerable communities. Little is known about the effect of those policies, but, there can be no doubt that the objectives of sustainable utilization and efficiency have taken complete precedence over those of stable employment and settlement.

In Iceland, the concentration of quota share holdings has been one of the most criticized aspects of the ITQ system, not least because of the perceived regional implications. Although this development has been analyzed (Runolfsson, 1999; Eythorsson 2000; Runolfsson and Arnarson 2001), few in-depth studies have been carried out to determine these effects. Runolfsson (1997) details the quota holdings for each region from 1984 to 1996 and concluded that net transfers to or from any region were small, and even that "the ITQ system has not, therefore, had any adverse regional impact in Iceland, and, on the contrary, has had a favorable impact in some regions". Others have drawn different conclusions, while at the same time admitting that the quota system is just one of many variables that may have had an effect on population development in rural communities in recent decades. Variations in the size of fish stocks and catches, new technologies, transport improvements and changes in tastes and preferences of consumers have all played a part.

Using Lorenz curves and Gini coefficients, Pálsson & Helgason (1995) demonstrate an increasing level of inequality and a growing concentration of cod quotas, concluding that the positive impacts ITQ have had on efficiency took place at the expense of equity in terms of distribution of quota holdings (see also Gatewood, 1993; Sagoff, 1988; LeGrand, 1991).

Studies tackling inequality in fisheries are often only fisherman, vessel or quota-owner oriented (Abayomi & Yandle, 2012; Chan & Pan, 2014; Perez-Labajos *et al.*, 2006).

This paper reports our effort to extend the calculation of Gini-coefficients for distribution of quotas firms. We also report the share of the biggest firms in quotas allocated during the period from 1984 to 2014.

Quotas and hook-quotas in the Icelandic ITQ system

The current Icelandic ITQ system applies to 25 different fisheries, which represent about 98 % of landed value (Matthíasson and Agnarson, 2010). The Ministry of Fisheries and Agriculture determines the TAC for each fishery for the next fishing year (September-August).

If the aim of restricting the share of a single firm in quota holdings was to prevent excessive concentration it can hardly be characterized as effective. Table 1 shows that the part of the TAC owned by the largest harvesting firms has been increasing since 1984, as the Directorate of Fisheries recorded. TAC-shares of the largest, the 5 largest and the 10 largest firms have almost tripled since the enforcement of the regular-quotas and the hook-quotas systems.

Results

Table 1 shows the share (in %) allocated to the largest firm and the 5, 10 and 25 largest firms from 1984 to 2015. The table reveals that the share of the largest firm in the regular quota system increases almost fourfold over this 30 year period, from 4,1% to 11,9%. The 5 largest firms increase their lot 2-3 times during the period, from 13,4% to 35,2%. The 10 largest firms commanded a fifth of the quotas in 1984 but they command more than half (56,5%) in 2015. The 25 largest firms go from being significant players in the industry in 1984 to being dominant players in 2015! A similar development can be registered for the hook-quota system during its much shorter life-span. The share of the largest firm triples over a period of 15 years but from a lower starting point then is the case for the regular quota system. Obviously the size distribution that is present when quotas are introduced is not optimal for the quota regulated fisheries.

Table 1. Share of the allocated regular-quotas and hook-quotas owned by the largest harvesting companies in Iceland from 1984 to 2015 (in %)

	Regular-quotas				Hook-quotas			
Year	Largest firm	5 largest	10 largest	25 largest	Largest firm	5 largest	10 largest	25 largest
1984	4,1	13,4	21,4	38,2				
1990	4,3	14,0	21,9	39,2				
1992-93	3,6	15,8	25,1	40,0				
1993-94	3,4	15,9	25,0	40,6				
1994-95	3,5	15,5	25,3	41,3				
1995-96	4,0	16,5	26,4	43,2				
1996-97	3,6	16,1	26,6	43,5				
1997-98	4,1	16,7	27,1	45,1				
1998-99	5,8	21,2	32,8	50,5				
1999-00	6,5	22,5	34,8	56,1				
2000-01	7,3	29,1	48,1	71,2				
2001-02	7,3	25,7	44,1	66,5	2,0	7,0	11,8	23,1
2002-03	8,7	26,1	42,6	67,6	1,9	7,9	13,7	26,0
2003-04	8,7	27,5	45,3	70,3	2,6	9,4	16,1	30,6
2004-05	9,1	28,0	46,8	72,1	2,1	8,7	14,1	26,6
2005-06	9,5	30,9	51,2	76,5	3,4	12,5	20,1	35,9
2006-07	9,9	30,7	51,3	78,9	4,3	15,1	24,2	44,1
2007-08	10,4	34,4	56,3	80,6	4,3	17,7	29,9	52,7
2008-09	9,6	31,7	53,9	79,2	4,7	18,7	30,5	51,4
2009-10	10,8	33,1	55,2	79,2	4,8	17,7	29,2	50,2
2010-11	11,7	36,6	58,9	81,6	3,9	17,3	29,9	49,0
2011-12	11,5	35,2	55,2	80,6	4,4	19,6	32,2	53,8
2012-13	11,7	35,5	56,1	82,5	4,2	19,0	32,7	55,0
2013-14	12,3	36,0	57,0	82,5	5,7	18,2	29,9	53,2
2014-15	11,9	35,2	56,5	82,6	5,8	20,9	33,6	56,7

Concentration by harbors

Concentration of quotas by firms is affected by economies of scale and scope. A firm operating many vessels and participating in more than one type of fisheries may be more profitable than a collection of firms operating the same vessels in the same fisheries' as the integrated firm may be more resilient in face of unexpected events. Hence, from socioeconomic view the main concern is not the concentration by firms but distribution by harbors. In Iceland, each vessel is allocated to a home port which again is allocated to one of 8 regions (South, Southern Peninsula, Capital region, West, Westfjords, Northwest, Northeast and East). Littoral "fishing villages" (Magnusson, 2006) are often home ports for one or several vessels. Table 2 shows the Gini coefficients for distribution by harbors both across the whole country and across each of the 8 regionsTable 2. Gini coefficients for the allocation of regular-quotas in fishing harbors

Year	Whole country	South	South-ern Peninsula	Capital region	West	West-fjords	North west	North east	East
1991	0,6417	0,6102	0,5384	0,6452	0,5876	0,5916	0,5416	0,6340	0,4636
1992	0,6774	0,6112	0,5440	0,6610	0,5968	0,5959	0,5431	0,6472	0,4611
1993	0,6725	0,6248	0,5508	0,6715	0,5979	0,6559	0,5527	0,6601	0,4829
1994	0,6752	0,6250	0,5407	0,6826	0,5806	0,6563	0,5541	0,6648	0,4955
1995	0,6870	0,6348	0,5378	0,7085	0,5920	0,7201	0,5577	0,6673	0,5290
1996	0,6927	0,6501	0,5148	0,6894	0,5801	0,7013	0,5846	0,6769	0,5488
1997	0,6859	0,6424	0,5367	0,6700	0,5354	0,7129	0,5586	0,6663	0,5597
1998	0,6989	0,6311	0,5755	0,6789	0,5640	0,6613	0,6030	0,6766	0,5516
1999	0,7062	0,6312	0,5891	0,6746	0,5720	0,6129	0,6573	0,7083	0,5267
2000	0,7293	0,6246	0,6306	0,6924	0,5919	0,6821	0,6544	0,7458	0,4930
2001	0,7380	0,6416	0,6869	0,6984	0,5962	0,6550	0,6548	0,7702	0,5419
2002	0,7519	0,6438	0,6861	0,7075	0,5980	0,6846	0,6639	0,7561	0,6310
2003	0,7484	0,6461	0,6871	0,6962	0,5764	0,6895	0,6875	0,7546	0,6246
2004	0,7293	0,6450	0,6766	0,6928	0,5815	0,6813	0,6675	0,6939	0,6088
2005	0,7401	0,6313	0,6928	0,7078	0,5815	0,6714	0,6619	0,7469	0,6020
2006	0,7626	0,6912	0,7031	0,6952	0,5878	0,6830	0,7157	0,7853	0,6410
2007	0,7733	0,7196	0,6561	0,7348	0,5914	0,7406	0,7141	0,7094	0,5947
2008	0,7453	0,6935	0,6731	0,7168	0,5838	0,7044	0,7071	0,6860	0,6264
2009	0,7538	0,6898	0,6753	0,7183	0,5956	0,7156	0,7123	0,6958	0,6104
2010	0,7593	0,6946	0,6983	0,7198	0,6040	0,7237	0,6930	0,6951	0,6259
2011	0,7532	0,6951	0,6930	0,7105	0,6034	0,7253	0,6995	0,7157	0,6140
2012	0,7432	0,6796	0,6896	0,7177	0,5917	0,7164	0,7053	0,6892	0,6077
2013	0,7632	0,6993	0,6926	0,7512	0,6425	0,7169	0,7087	0,6924	0,6206
2014	0,7917	0,7018	0,7161	0,7886	0,6594	0,7675	0,7257	0,7359	0,7380
Mean value	0,7258	0,6566	0,6327	0,7012	0,5913	0,6861	0,6468	0,7031	0,5750

Table 2 shows that in 1991 the Gini[1] coefficient for regular-quotas allocation is lowest in the Eastern region and highest in the Capital region reflecting the fact that Reykjavik was the home base of many of the big fishing companies. In 2002, it is now lowest in the Western region and highest in the North East, reflecting growth of strong fishing company based in Akureyri. In 2014 the Gini coefficient is still lowest in the

[1] For defination see Gini (1913).

Western region, and the concentration of regular-quotas is again higher in the Capital Area.

The Gini coefficient is higher for the country as a whole than for any of the sub-areas. This is natural and is the consequence of the construction of the index.

Table 2 further shows that regular-quotas allocation inequalities are increasing in Iceland in general, from 0.64 to 0.79 (an increase of 23.4 %) and in every single region too, with 6 out of 8 reaching the maximum amount of positive sign tests (Southern region, Southern Peninsula, Capital region, Westfjords, Northwestern region and Eastern region). In the Western region, only a slight trend is observed. The Eastern region registered the biggest increase in the Gini coefficient, growing by 59.2 % from 0.46 to almost than 0.74 over the period. Note that the Eastern region is the base for pelagic fisheries which have been gaining strength during the period. In average, the Western region has had the most stable regular-quotas allocation, the Eastern region the most equalitarian one, and the Capital region and the Northeastern region the most concentrated. Note that the North East is the home of Samherji and the Capital Area is the home of HB Grandi, two of the largest fishing and processing companies in Iceland. Moreover, 7 out of the 25 largest regular-quotas holding firms (in 2014) are located in the North East (this is more than in any other region), and none in the East.

Discussion

When trying to interpret consequences of regular-quotas allocation on communities, one has to keep in mind that the introduction and implementation of the ITQ system in Iceland coincided with a rapid development of equipment, efficiency in catch technology and equally or more rapid development of processor technology. It is then notoriously difficult to disentangle "natural" development from development caused by the introduction of the ITQ systems. However, those results raise potential hypotheses concerning the impacts of ITQ unequal allocation, for both systems.

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