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Local Markets and Price Premiums

The Case of the Establishment of the Stockholm Fish Auction

Local markets and price premiums– the case of the establishment of the Stockholm fish auction

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Abstract

The promotion of locally produced food has been a growing marketing trend in recent years. Locally produced food is associated with positive values such as environmental benefits, fresher and safer products as well as contributing to building closer ties between people in local communities. We use a case study were a local fish auction was established in the Stockholm area in Sweden with the aim to supply the local market with fish, mainly pikeperch, from the region. Using monthly prices we investigate if the establishment of the auction has resulted in a price premium and separate markets for locally caught pikeperch. Our results show that there is no price premium and that the Stockholm market is not decoupled from the national market after the establishment of the new auction. In fact, the Swedish market appears to become more integrated and direct buyers of pikeperch have to pay more to fishers after the establishment of the auction.

Keywords: Local food, Price premium, Price integration, Fish markets

Declarations of interest: none

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1. Introduction

Supply from local food producers to a local market is often associated with positive effects on local economies as well as shorter transports resulting in less pollution and fresher products. In recent years “buying local” has become an important trend in food marketing in the developed world with examples such as farmer’s markets, farm gate sales and box delivery systems. The trend has also gained support from a political direction. The European Union’s rural development policy acknowledge the promotion of local markets and short supply circuits as one of several potential areas that member states may choose to support (ENRD, 2016). Similarly, the European Union’s Fisheries Fund supports local partnership projects that fund the promotion of sales of locally caught fish (European Commission, 2014). Thus, from a policy perspective, it is important to know if initiatives to promote local food are effective.

Previous studies have shown that there is willingness to pay for a “local” attribute on food products (Thilmany et. al. 2008, Printezis et. al., 2019). In the context of fish products Meas and Hu (2014) find that consumers are more likely to choose farmed tilapia if it is claimed to be raised locally and Brinson et.al. (2011) find that fish that is directly marketed to consumers receive higher prices. Studies using hedonic methods to elicit attribute prices from actual sales have also shown that buyers value a local origin of a product. For example, Asche and Guillen (2012) show that at a wholesale market in Barcelona hake that is of Catalonian origin has a higher price than fish of other origins. Ishida and Fukushige (2010) show that producers of mackerel in Japan can earn higher prices by introducing a regional brand. Some of the reasons for paying a “local” price premium mentioned in the literature are that shorter transports are seen as more environmentally friendly, that there is a will to support the local economy or that the relationship between buyers or sellers is closer with local sales (Thilmany et.al., 2008, Winfree and Watson, 2017, Denver et.al., 2019)). For example, Wakamatsu and Wakamatsu (2017) find that effective face-to-face marketing is key in generating price premiums in small-

scale fisheries around the world. It is also often argued that locally produced goods are of higher quality, are healthier and safer to eat (Winfree and Watson, 2017).

The establishment of the Stockholm fish auction in November 2016 was the outcome of a discussion on how to provide better service to fishers and buyers in the east part of Sweden (Stockholms fiskauktion, 2019). Arguments such as lowering the environmental footprint of fish products when avoiding transports to and from the Gothenburg auction on the Swedish west coast was put forward as well the creation of a local market. If small-scale local fishermen could sell their produce on the auction to local buyers in the Stockholm area producers as well as consumers could benefit (MSC, 2016; Hagelin, 2016)). Customers would have the possibility to get to know the fishers and their supplies as the fish would be on display in storerooms in a central location in Stockholm (Hagelin, 2016). Since its establishment, the Stockholm fish auction has become important for sales of freshwater fish (mainly pikeperch, eel and pike) from two of the largest lakes in Sweden. A mix of local, national and international buyers are taking part in the auction that can be accessed digitally from anywhere in Europe.

From a policy perspective, it is also important to know to what extent a market may be regarded as local, and to what extent it is influenced by prices in neighboring geographical areas. For example, local initiatives to increase prices by reducing landings will not be successful if local landings is part of an integrated larger market. In this case only large-scale coordinated reductions in landings will affect prices. There exists a large literature on market integration of fish products (e.g. Asche et al., 1999; Asche et al. 2012; Nielsen, 2005; Wakamatsu (2014); Blomquist, 2015; Mulazzani et al., 2015). Wakamatsu (2014) show that market segmentation of fish products (in case of eco-labelled flounder in Japan) may not necessary lead to higher prices. But there might still be segmentation of markets that could benefit producers. Wakamatsu finds that the market for eco-labelled flounder has become less influenced by other markets (more segmented) after the introduction of the eco-labelling scheme, suggesting that

eco-fishers became less sensitive to exogenous shocks. Market segmentation by providing local fish can therefore be beneficial to fish producers irrespective of potential price premiums, as it may lead to fewer competitors and more stable revenues.

The new market channel created by the establishment of the Stockholm auction could potentially have effects on fish prices. If consumers value locally-caught fish prices for this fish might be higher at the Stockholm auction than at other sale places. The overall goal of this study is to investigate whether providing local seafood has benefited local producers of fish in Sweden. As a case study, we investigate how prices of pikeperch (*Stizostedion lucioperca L.*) have been affected by the establishment of the Stockholm fish auction. If the auction has resulted in the creation of a local market where buyers are willing to pay a price premium for locally produced fish we expect prices of locally caught fish to increase. Although it is difficult to know exactly what attributes might be included in a price premium many of the attributes commonly associated with local produce are likely to be positively valued in the context this case study. The price premium might potentially be associated with environmental benefit because of shorter transports, a will to support the local community, a belief that fish is fresher and of higher quality when caught nearby or that closer ties between sellers and buyers improve the safety of the product.

To test if there is a price premium we use monthly sales data of pikeperch in Sweden before and after the establishment of the Stockholm fish auction. In addition, we investigate if pikeperch from lakes in the Stockholm area are part of an integrated Swedish market. In doing so, we pay particular attention to differences in market integration in the period before and after the establishment of the Stockholm fish auction. If there is a "local" demand for fish from lakes close to the Stockholm area we expect to find less integration after the establishment of the auction and potentially higher prices for fish from lakes in the Stockholm area. To the best of

our knowledge, no previous study has investigated the effects of establishing a fish auction for local fish on price premiums or market segmentation.

We begin by describing the Swedish market for pikeperch and the Stockholm fish auction in section 2. In section 3 we describe our data and provide some background statistics. Then, in section 4, we present our method and in section 5 main results are presented. We present some additional results in section 6, followed by a discussion of the policy implications of our findings in section 7.

2. Background

The commercially most important fresh-water fish species in Sweden are pikeperch and crayfish (*Pacifastacus leniusculus*). First-hand sales of pikeperch accounted for 48 percent of the total sales of fresh-water fish in 2017 whereas the corresponding share for crayfish was 38 percent (SwAM, 2018). Most of the catches of pikeperch were taking place in one of the four largest lakes in Sweden (Figure 1).

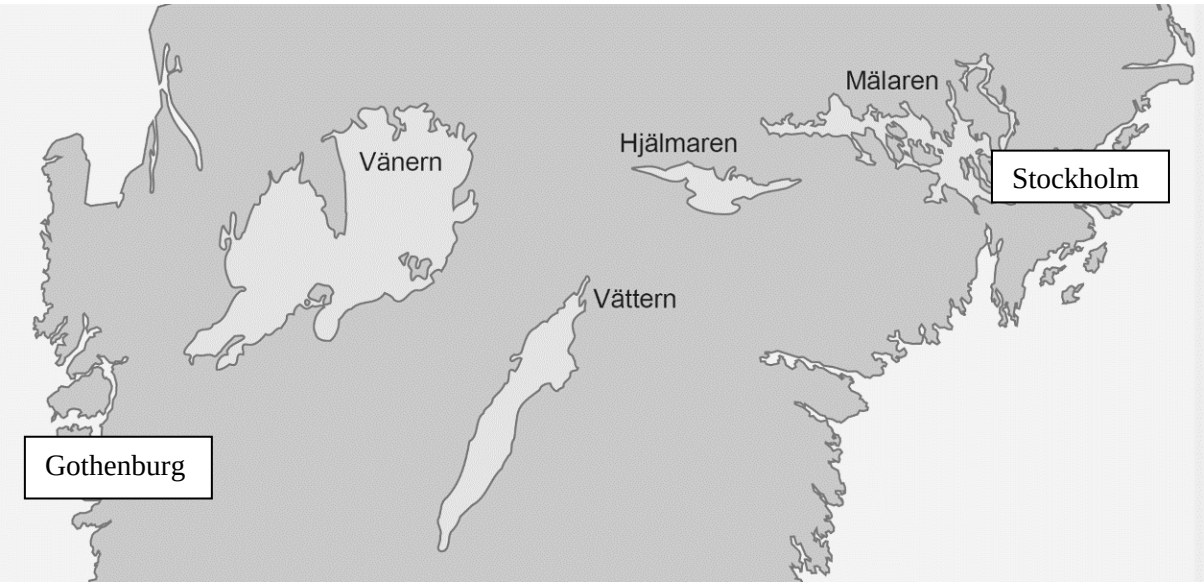

Figure 1: The four largest lakes in Sweden and the location of the Gothenburg and Stockholm fish auctions.

Source: SMHI

In 2017 Swedish commercial fishermen landed 654 tons of pikeperch from Swedish lakes. An increase in catches is observed in the large lakes in 2016 and 2017 when compared to catches in 2007-2015 (SwAM, 2019). Most catches take place in Hjälmaren (40 percent), followed by Mälaren (28 percent) and Vänern (21 percent) (SwAM 2018). The natural conditions in Vättern are not suitable for pikeperch although some landings occur. The pikeperch fisheries in the three lakes are currently considered sustainable (SwAM, 2019) and they are also certified by the Marine Stewardship Council (MSC). The pikeperch fishery in Hjälmaren was certified already in 2007 whereas the fisheries in Mälaren and Vänern were certified ten years later in summer 2017. Biological advice is given by the Swedish University of Agricultural Sciences (SLU) and current (2019) recommendations state that catches should not increase in any of the three large lakes (SwAM, 2019). Commercial fishing is regulated by licenses, gear permits and minimum catchable sizes (SwAM, 2018). In addition to commercial catches there is also a substantial recreational fishing for pikeperch in Sweden. The amount of catches are uncertain but was estimated to be between 145 and 453 tons in 2017 (SwAM, 2019).

Today (2019), there are three fish auctions in Sweden; Gothenburg, Smogen and Stockholm. The Gothenburg and Smogen auctions where both established a century ago whereas the Stockholm auction was, as mentioned, established recently in 2016. The largest fish auction in Sweden is the Gothenburg auction where most species caught by Swedish marine and inland fisheries are sold. The Gothenburg auction is a traditional auction where buyers bid in an auction hall. The Smogen auction, established in 1919, is an important auction for shellfish whereas the Stockholm auction is mainly concentrated on sales of fish from inland waters. The Stockholm auction is part of the Pan European Fish Auctions (PEFA) where a clock is showing the price as it descends. When a buyer presses a button (either on a device supplied by the auction or digitally by pressing a button on the computer) the sale is closed (PEFA, 2018).

Data provided by the Stockholm fish auction from November 2016 to October 2019 shows that pikeperch was the most important species sold at the auction. Total sales during this period amounted to 52 million SEK. In comparison the sales value of the second most important species, eel, was around 8 million SEK and the third most important species, pike, 3 million SEK. One Swedish krona was around 0, 09 euro in 2019. Using data of sales in quantities from the Stockholm fish auction reveals that around 34 percent of the pikeperch is sold to local buyers, 34 percent to foreign buyers and 32 percent to other national buyers. Foreign buyers are mainly based in the Netherlands. Local buyers are defined as buyers in the Stockholm, Uppsala and Södermanland regions. During the time period there were 22 local buyers purchasing pikeperch from the auction where five buyers dominated with 87 percent of the quantity of local sales. Many of the national buyers are exporters selling fish on to buyers in other European countries (personal communication with Bernt-Ove Andreen at the Stockholm fish auction, 2019-10-30).

The auction fee is 5.5 percent at the Gothenburg auction as well as at the Stockholm auction. Transport costs are paid by the sellers and buyers and are not included in the auction fees at the Gothenburg auction (personal communication with Magnus Nilsson at Gothenburg fish auction, 2019-10-23). Transport costs to the Stockholm auction are also paid by sellers. As an option sellers can pay 4.50 SEK per kilo and have their fish picked up by the auction (communication with Bernt-Ove Andreen at Stockholm fish auction, 2019-10-30).

3. Data and background statistics

We use sales note data provided by the Swedish Agency for Marine and Water Management (SwAM) containing monthly observations of quantities and values of pikeperch from the four largest lakes in Sweden (i.e. Vänern, Vättern, Mälaren and Hjälmaren). Catches in Vättern are minimal (less than one ton in 2017) and will be disregarded. Data also contain information

about were the fish has been sold, i.e. the name of the auctions or the direct buyers. As mentioned above the Smogen auction is mainly selling shellfish and we will therefore not analyze sales at this auction in the rest of the paper. The time period covered starts in January 2015 and ends in September 2018. However, the data is somewhat incomplete as auction sales are missing for certain months and thus we have collected complementary data from the Gothenburg and Stockholm auctions. Sales from the Stockholm fish auction for the autumn months of 2017 (August-December) are missing in the data from SwAM and data provided by the Stockholm fish auction have been used to complete the time series. Unfortunately there is no information about lake of origin in this data. We also notice that the Gothenburg auction on several occasions report bi-monthly sales to SwAM. For this reason we have replaced data from SwAM with monthly data calculated from a dataset provided by the Gothenburg fish auction. In this data we are able to separate sales originating from different lakes. Finally, five outlier observations have been removed where the average price was above 150 SEK or below 25 SEK.

In Table 1 quantities of pikeperch sold at the two auctions and sold as direct sales (i.e. going directly to wholesalers) are reported. We look at the period before and after the Stockholm fish auction was established. Before 2017 most sales of pikeperch on the Swedish market went through direct sales. When the Stockholm auction was established market shares of different sales-outlets changed. The Gothenburg auction sold less pikeperch than before and sales to direct buyers also decreased from over 60 percent of total sales to just 40 percent. In the period after the establishment around 42 percent of sales on the Swedish market took place at the Stockholm auction making the new auction the largest sales outlet for pikeperch in Sweden.

	Gothenburg auction	Stockholm auction	Direct sales	Total quantity (tons)
Pre- 2017 (jan 2015-dec 2016)	38 %	-	62 %	805
Post- 2017 (jan 2017--sept2018)	18 %	42 %	40 %	881

Table 1: Quantities of pike-perch for different market channels before and after the establishment of the Stockholm auction

The total quantity sold is larger in the period after the establishment of the Stockholm auction. Note that the post-2017 period is shorter than the pre-2017 period (that ends in September 2018). The total quantities of pikeperch sold on the Swedish market are thus larger on average post-2017. Below (Table 2), we have a look at the sourcing of pikeperch from three lakes. Most of the sales come from Hjälmaren. For example, in 2017, 54 percent of the pikeperch from the three lakes came from Hjälmaren, 30 percent from Mälaren and 16 percent from Vänern.

	Gothenburg auction	Stockholm auction	Direct sales	Total quantity (tons)
Hjälmaren				
2015	3 %	-	97 %	163
2016	-	-	100 %	267
2017	-	28 %	72 %	287
2018	-	35 %	65 %	142
Mälaren				
2015	89 %	0 %	11 %	88
2016	83 %	0 %	17 %	130

2017	13 %	78 %	9 %	157
2018	11 %	89 %	-	103
Vänern				
2015	59 %	-	41 %	74
2016	80 %	-	20 %	82
2017	75 %	-	25 %	85
2018	81 %	5 %	14 %	86

Table 2: Shares of quantities of pikeperch for different sales outlets in different lakes, 2015-2018.*

*Note: Figures for 2018 are for 9 months only.

It is clear from Table 2 that markets are quite different for fish from the different Swedish lakes. Fish from Mälaren was mainly sold at the Gothenburg fish auction before the establishment of the Stockholm auction. When the Stockholm fish auction opened the majority of fish was instead sold at this auction. For fishers in Hjälmaren the establishment of the Stockholm fish auction meant that some fishers took the opportunity to sell fish through the auction instead of direct sales. As regards pikeperch from Vänern the Stockholm fish auction does not appear to be an important market channel so far. A very small quantity is reported as sold at this auction, most likely because Vänern is further from Stockholm then the other two lakes. Fish from Vänern is mainly sold at the Gothenburg fish auction. The table also shows that direct sales have decreased since the establishment of the Stockholm auction. In 2015 there were eight direct buyers whereas in 2018 only two of these remained in the market.

4. Method

To investigate the effect of the establishment of the Stockholm fish auction on the pikeperch market we test two different aspects of price changes. First, we test if there is a price premium

for locally caught fish in the Stockholm region after the establishment of the auction. Second, we test if the Stockholm market becomes decoupled from the national market or if market integration has increased after the establishment of the auction.

In order to test if the price of pikeperch paid to fishers increased after the establishment of the Stockholm fish auction we compare the price development of fish originating from fishers located close to the Stockholm auction with fishers located close to the Gothenburg auction. If prices have increased for fishers close to Stockholm but not for the other group the Stockholm auction is a strong candidate for explaining the difference and the reason for the price premium could be that there is a "local" premium paid for fish in the Stockholm area. The idea here is to use prices from lake Vänern as a control group. Of course, we do not know what the development of prices would look like without the opening of the Stockholm auction but we can see from the preliminary statistics above that the Stockholm auction seems to attract local sellers. Most sales originate from Mälaren and Hjälmaren, which are the two lakes closest to Stockholm, whereas sales from Vänern are unusual. We do not claim to have a genuine control group since we acknowledge that also prices of Vänern fish could be affected by the establishment of the Stockholm auction. Buyers of Vänern fish at the Gothenburg auction could, in theory, turn to the Stockholm auction if prices of Vänern fish increase too much. However, we will assume that the longer distance to Stockholm and long established ties with the Gothenburg auction makes it less likely for Vänern fishers to sell at the Stockholm auction. We will therefore compare prices of Vänern fish to prices of fish from Mälaren and prices of fish from Hjälmaren. The reason for doing separate analysis of Mälaren and Hjälmaren are that the market channels differed before the opening of the new auction and that these two lakes are at varying distances from Stockholm. Mälaren is directly situated in the Stockholm region whereas Hjälmaren is around 200 kilometers from Stockholm (see Figure 1 above).

As shown by Wakamatsu (2014), segmentation of markets in the sense that prices become less similar over time, may not necessary lead to differences in average prices. To investigate whether or not the pikeperch market has become more segmented after the establishment of the Stockholm auction, we run a simple regression analysis. More specifically we investigate if prices of pikeperch sourced from the different lakes have become more or less similar by running the following regression:

$$p_t^1 = \alpha + \beta p_t^2 + \delta p_t^2 * D_t + \varepsilon_t \quad (1)$$

where p_t^1 is the price of fish from source 1 at time t, p_t^2 is the price of fish from source 2 at time t and D_t is a dummy variable indicating the period after the establishment of the Stockholm auction. If $\delta < 0$, prices have become less similar after the establishment.

It is also interesting to test hypothesis of the other coefficients in equation (1). More specifically, we test if $\alpha = 0$, $\beta = 1$ and if $\beta + \delta = 1$. If $\alpha \neq 0$ prices differ between goods due to factors such as transportation costs and quality differences. If $\beta = 1$ there is a one-to-one relationship between the prices of the two goods in the time period before the Stockholm auction was established. In this case, the Law of One Price (Stiegler, 1969) holds for pikeperch in Sweden. If $\beta + \delta = 1$ this relationship is present also in the period after the Stockholm fish auction was established.

5. Results

We start by comparing prices of pikeperch from Mälaren, the lake closest to Stockholm (see the map above), with prices for pikeperch from Vänern. If there is a "local" premium for fish from Mälaren after the establishment of the Stockholm auction we expect prices for fish from Mälaren to increase relative to fish from Vänern. Before the establishment of the Stockholm auction fish from Mälaren went on lorries to the Swedish west coast to be sold at the Gothenburg auction. After the establishment of the new auction most sales are sold on the new

auction and direct sales decrease until they stop entirely in the beginning of 2018. Do we find that prices of fish from Mälaren are higher than Vänern prices after the establishment of the nearby Stockholm fish auction, i.e. that there is a "local" premium for fish from Mälaren? Diagram 1 shows average monthly prices of pikeperch from the two lakes. The red line in Diagram 1 is indicating the first month with data after the establishment of the Stockholm auction, i.e. January 2017.

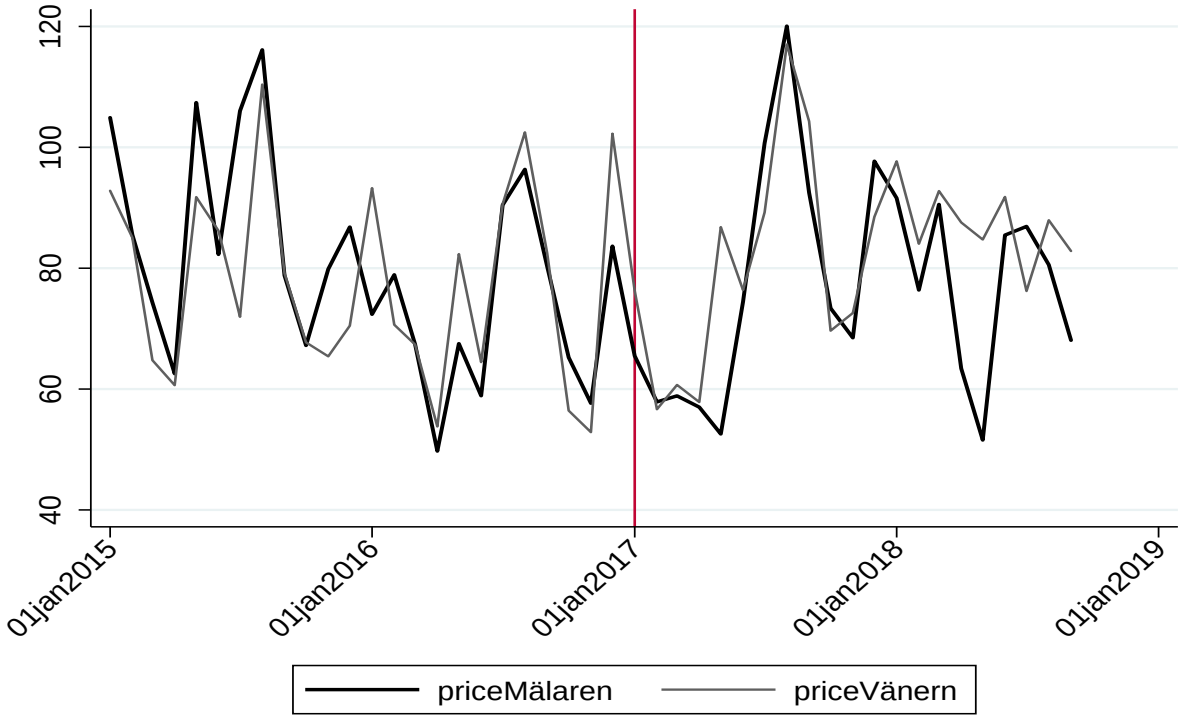

Diagram 1. Prices of pikeperch from Mälaren compared to prices of pikeperch from Vänern

Although there is a lot of price variation, prices for fish from Mälaren do not seem to change on average over the time period. On average fish from Mälaren is sold for one krona more than fish from Vänern before the establishment of the auction and for six kronor less after the establishment of the auction. Thus, the price of fish from Mälaren does not increase in the period after the establishment of the Stockholm auction and there is thus no evidence of there being a price premium of fish from Mälaren related to the opening of the auction. The lower price after the establishment seems to be related to price dips in certain months in the latter

period and are as such not an indication of a permanent trend. Running a regression of price differences on a dummy variable that is equal to one after the establishment of the auction and controlling for oulier observations in April and May 2018 shows that the effect of the establishment is insignificant.

The diagram also reveals that prices for fish from Mälaren and Vänern are closely following each other. This suggests that the price of fish from Mälaren cannot deviate too much from sales of fish from Vänern and indicates that the market for pikeperch from the two lakes is closely connected. Moreover, we find that prices are closely following each other also after the establishment of the Stockholm auction. We test for the law of one price using equation 1 with prices of fish from Mälaren and Vänern. We cannot reject the hypothesis that $\alpha = 0$ and we also find that the law of one price holds in the period before the establishment of the Stockholm auction, i.e. we cannot reject that β=1. The hypothesis that $\beta + \delta = 1$ is not rejected at the 5 % level but is rejected at the 10 % level. We conclude that prices are closely connected for fish from Mälaren and Vänern before the establishment of the Stockholm auction and that they are so also after the establishment (using the stricter level of statistical significance for rejection). This further support the notion that there is no local market for pikeperch in the Stockholm region after the establishment of the Stockholm auction.

Next, we compare average prices of fish from Hjälmaren with prices of fish from Vänern and see how prices develop. Hjälmaren is located about 200 kilometers from Stockholm and can be considered less local than Mälaren but as we see that fish from Hjälmaren are a significant part of sales at the Stockholm auction we will also investigate if there is a price premium for Hjälmaren fish after the establishment of the Stockholm auction.

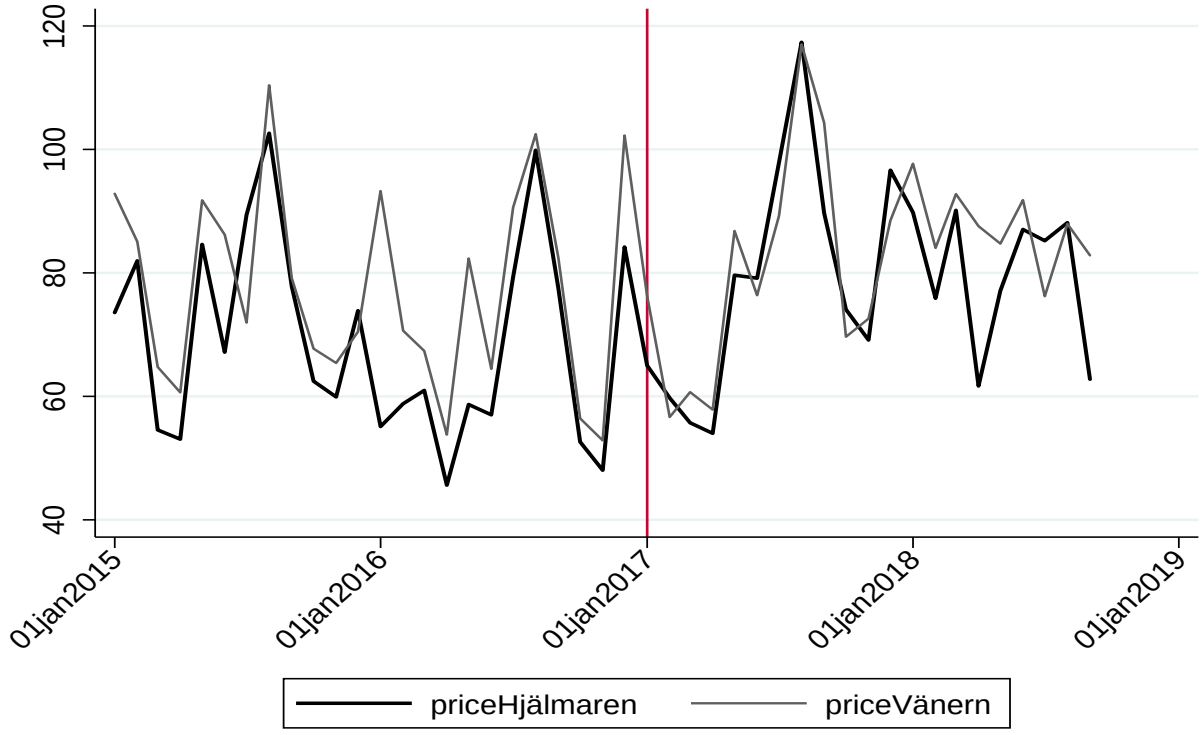

Diagram 2. Average price of pikeperch from Hjälmaren compared to average price of pikeperch from Vänern.

The diagram shows that prices of fish from Hjälmaren are on average lower than prices of fish from Vänern before the establishment of the Stockholm auction. The average monthly price difference in 2015-2016 is 9 kronor before the establishment of the auction and 5 kronor afterwards, i.e. the price difference is smaller in the latter period. Prices appear to have increased more for fish from Hjälmaren than for fish from Vänern and prices have become more alike for fish from the two lakes.

As was the case when investigating prices of fish from Mälaren, prices for fish from Hjälmaren and Vänern are closely following each other. This suggests that the price of fish from Hjälmaren cannot deviate too much from sales of fish from Vänern and indicates that the market for pikeperch is closely connected. To test the assumption that fish from Hjälmaren and fish from Vänern are on the same market we use equation 1 and see if there is a break in the period after the establishment of the Stockholm auction using equation 1. We find that we

cannot reject the hypothesis that $\alpha = 0$ but that we can reject that $\beta=1$ at the 5% level whereas the hypothesis that $\beta + \delta = 1$ cannot be rejected at the 5 % level. Thus, prices for fish from the two lakes are following each other more closely after the establishment of the Stockholm auction. Markets appear to become more integrated than before which is evidence against the notion that there is a local market for fish in the Stockholm region.

Do the results above mean that there is a price premium for fish from Hjälmaren after the establishment of the Stockholm auction? There are a number of reasons why we believe that this is unlikely. First, the argument that there is a "local" premium for fish from Hjälmaren, that is further from Stockholm, than for the closer situated Mälaren, is hard to make. Second, it must be kept in mind that no fish from Hjälmaren was sold at auctions before the establishment of the Stockholm auction and that price setting is different at auctions and for other buyers. Since fishers have to pay auction fees and transport costs when selling at auctions prices must be higher than at direct sales. Thus, the price increase in diagram 3 could be an effect of auction prices in general being higher than direct sales prices. As mentioned, auction fees are currently 5.5 percent of the sales value at the Gothenburg and Stockholm auctions.

6. Why does the price for fish from Hjälmaren increase?

Although it might be the case that the increase in prices for fish in Hjälmaren is due to higher prices being paid at auctions it is also possible that the establishment of the auction affected prices of direct sales. As discussed in e.g. Helstad et al. (2005) an efficient auction market would generate a strong link between auction prices and prices at direct sales. To investigate this issue, we start by comparing auction prices with prices received when selling pikeperch directly to companies (Diagram 3). Note that all auction sales before the establishment take place at the Gothenburg auction and that sales from all three lakes are included. The diagram reveals that auction markets and direct markets are closely connected. It also shows that prices

paid at auctions appear to be slightly higher than prices paid by other buyers, which is consistent with previous findings in the literature (e.g. Trondsen et al. 2003). Lower prices paid by non-action buyers might be compensated for by fishers not having to pay for sales costs.

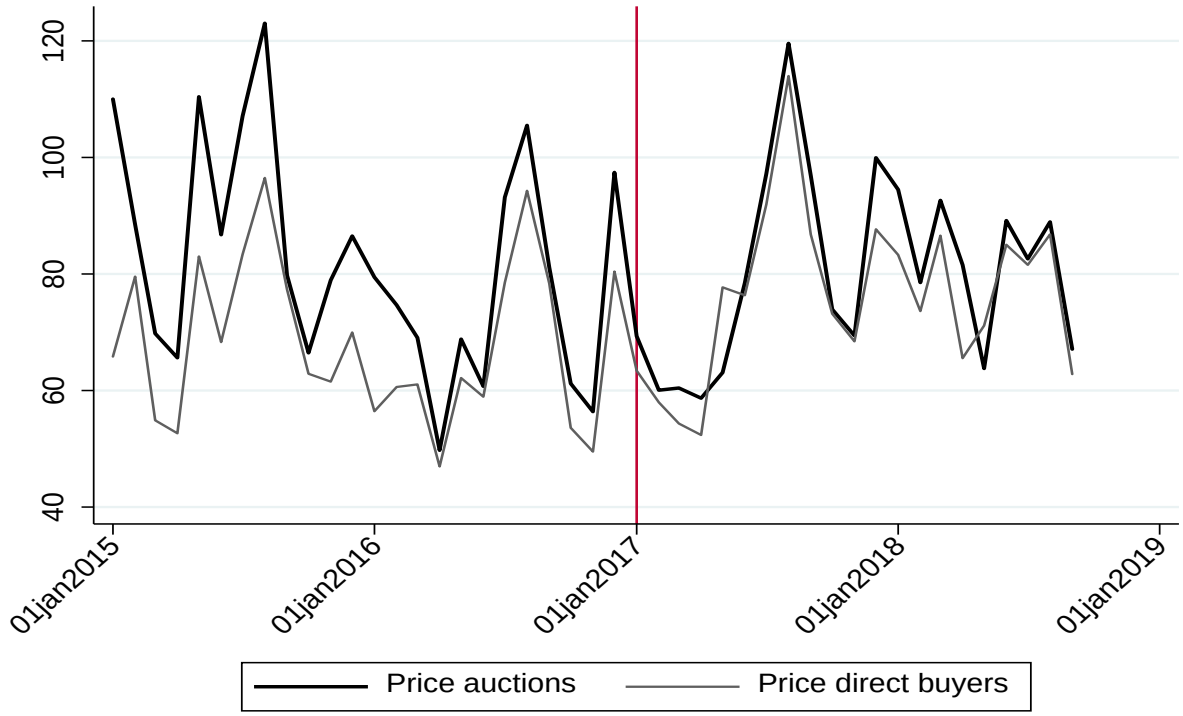

Diagram 3. Auction prices vs. prices at direct sales

Looking at auction sales there does not seem to be any price differences before and after the establishment of the Stockholm auction. The average auction price is 82 SEK/kilo before the establishment and 81 SEK/kilo after the establishment. Direct sales, on the other hand, appear to have increased on average. Prices were 68 SEK/kilo on average in 2015 and 2016 and increased to 77 SEK/kilo on average in 2017 and 2018. Does this mean that prices at direct sales have adapted to auction prices after the establishment of the Stockholm auction?

The fact that the price difference between auction and direct sales has decreased from 14 to 4 SEK/kilo suggests that this is the case. Using equation 1 with prices for auction sales and direct sales shows that the law of one price does not hold before 2017 but does so after 2017. On the

other hand, looking closely at Diagram 4 reveals that the gap between the two price lines is starting to shrink already in mid-2016. Although it is possible that an adaption is taking place before the opening of the auction it is also possible that there are other factors at play here. It is difficult to relate the price changes to the opening up of the auction by merely comparing auction prices to prices at direct sales. To investigate this issue more carefully, we compare prices of direct sales of pikeperch from different lakes.

We start by investigating whether prices at direct sales have been affected by the establishment of the Stockholm auction, as indicated by Diagram 1 above. In this analysis, we compare prices of direct sales from Hjälmaren with prices from Vänern. It is evident from Table 2 that fishers in Hjälmaren have reallocated some of their sales from direct sales to the new auction. In other words, if prices at direct sales have adapted to auction prices, we expect to see higher prices of pikeperch from Hjälmaren after 1 January 2017.

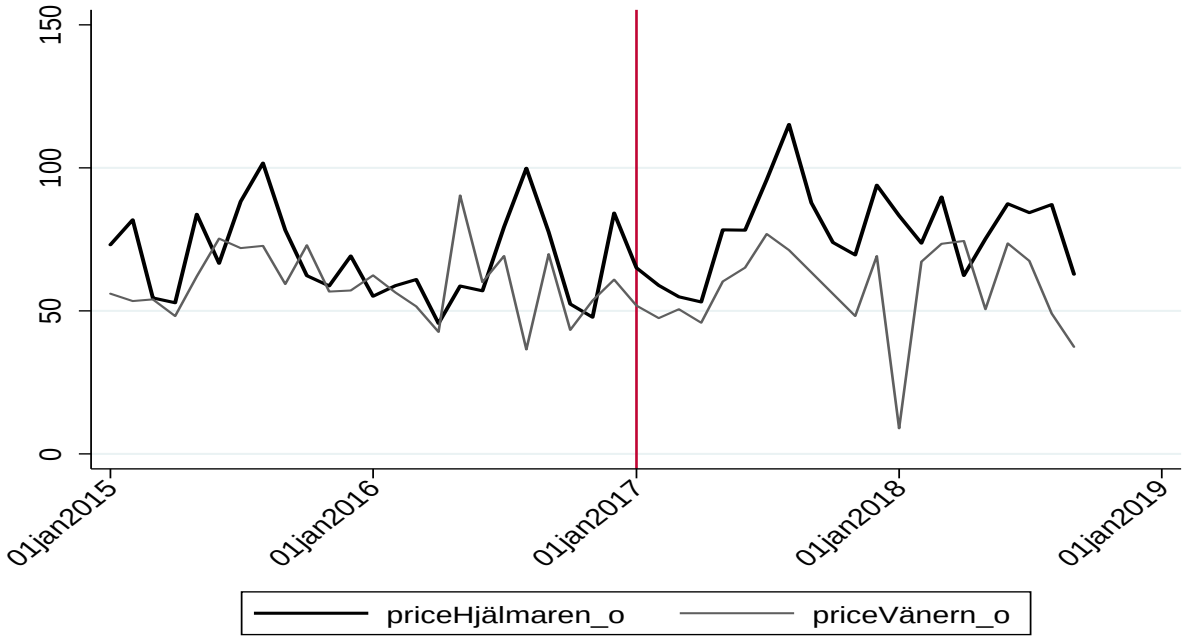

Diagram 4. Prices paid for pikeperch from Hjälmaren compared to prices paid for pikeperch from Vänern by buyers at direct sales.

Diagram 4 shows that prices paid at direct sales are rather similar *before* the establishment of the Stockholm fish auction. *After* the establishment a gap in prices appear and the price of direct sales from Hjälmaren is higher in all months except one. While the magnitude of this effect is not huge, it indicates that direct buyers had to increase prices to keep fishers from turning to the Stockholm auction.

The graphical analysis above suggests that the Stockholm auction affected prices that are paid by direct buyers. We explore this issue further and test the hypothesis that direct buyers of fish from Hjälmaren had to pay higher prices after the establishment of the auction than buyers of fish from Vänern. We calculate the difference between two time series and use this series as the dependent variable in the regression (difference-in-differences regression):

$$P_t^{HJ\_o} - P_t^{VÄ\_o} = \alpha + \beta post + \varepsilon_t \quad (2)$$

Price differences between the sales outlets are expected to be smaller when sales are large since deviations are expected to be smaller. The explanatory variable of most interest is the dummy variable indicating the establishment of the Stockholm auction.

We use equation 2 to compare the average price at direct sales from Hjälmaren are compared with direct sales from Vänern (equation 2). Two models based on equation 2 are presented in Table 3: Model 1 without any additional controls and Model 2 where we also add controls for outlier observations.

	(1)	(2)
Stockholm auction	11.401*	10.493*
aug-16		56.632***
jan-18		57.125***
Constant	8.997*	6.732*
N	43	43

Table 3: Price differences (in SEK) between direct buyers in Hjälmaren and Vänern before and after the opening of the Stockholm auction

Note: * for p<.05, ** for p<.01, and *** for p<.001.

We see that direct buyers in general pay higher prices for fish from Hjälmaren than for fish from Vänern (the constant is between 8 and 9 SEK/kilo). This could be because fish from Hjälmaren have different characteristics or because of particular sales conditions that apply to fishers in these lakes. Thus, any changes that affect prices of fish from both lakes simultaneously, as well as permanent price differences between the lakes, are kept constant in the regression framework. Assuming that there are no other factors affecting prices of pikeperch systematically different in the lakes after 2017, the Stockholm auction variable can be interpreted as the price effect of establishing the new auction. According to the estimates prices paid by direct buyers increase by 11 SEK/kilo.

The coefficient on the Stockholm auction variable is positive indicating that the difference in prices paid by direct buyers increase after 1 January 2017. That is, the price difference between fish from different lakes appear to be higher in the latter period. In other words, these results imply that fishers in Hjälmaren receive higher prices from direct sales in the period after the establishment of the Stockholm fish auction. We also see that the coefficient on the quantity

variable is negative indicating that when larger quantities are sold the price difference is smaller. Similarly, Helstad et.al (2005) have found that price links between auction sales and direct sales are weaker when auction sales are small. In Model 2 we control for influential observations. In January 2018 fishers in Hjälmaren on average receive 74 SEK more than fishers in Vänern according to data and in August 2016 the price difference is 63 SEK. More importantly though, is that the inclusion of dummy variables for extreme values does not change the sign of our coefficient for the post-Stockholm period. Thus, we still see that the price differences increase indicating that direct buyers had to pay more for fish from Hjälmaren in the period after the Stockholm fish auction had opened. This is an indication that direct sales become less profitable over time and suggests that the opening of the Stockholm auction contributed to change the structure of the market structure.

In sum, we find that price integration increases between pikeperch sold at auctions and pikeperch sold to direct buyers in the period after the establishment of the Stockholm auction. More specifically, we find that direct buyers of fish from Hjälmaren have to pay higher prices after the establishment of the auction. For fishers in Mälaren most sales went to the Gothenburg auction before the opening of the Stockholm auction and the market was already integrated in the period before the new auction was established. Thus, we do not see any changes in prices that we can relate to the opening of the new auction for fish from Mälaren.

7. Policy implications

Policy initiatives such as the European Union's Fisheries Fund support of local partnership projects that fund the promotion of sales of locally caught fish (European Commission, 2014) are difficult to evaluate. From a socio-economic perspective there may be reasons to support local products if these are providing public goods but the link between local attributes and the public goods they might provide is often not clear. On the other hand, if a local attribute is

valued at the market it might be possible to charge a price premium for it. There are numerous studies indicating that consumers' are willing to pay for a local attribute. But producers will be unwilling to supply the attribute unless there are gains on the market since it is at the market that we can study if there is a price premium for local food. In our case study we investigate if there is a price premium on locally caught pikeperch in the Stockholm area after the establishment of a nearby auction.

Policies directed at a local market may fail if the market is part of a larger integrated market. Finding out if a local market is integrated is therefore of interest for regional policy makers. For example, assuming that the market is integrated, restrictive fishing regulations in a local lake may decrease catches but fishers will not be compensated by higher local prices. Profits could thus decrease for fishers. Similarly, a regulation that allows an increase in supply will not be matched with lower prices on an integrated market. Such an increase in supply is thus more likely to increase profits for fishers. Furthermore, a market that is part of an integrated market will not be protected from policy changes that affect the demand or supply of fish in other parts of the market. In sum, the market effect of a policy could be very different depending on whether it affects an integrated market or a segregated market.

We find that there is no price premium on pikeperch that is caught and sold locally. We also find that markets are integrated and that prices do not deviate between different sales outlets, i.e. prices of fish sold to different types of buyers and prices of fish from different lakes are closely following each other from month to month. When the new auction opens, integration increases in the sense that prices of direct sales become more similar to prices of auction sales. Hence, rather than creating a market that can be considered local the auction has further contributed to integration of national and international markets. The market for pikeperch in Europe is the destination for a large part of sales of Swedish pikeperch and sellers have to adapt to prevailing international prices. For example, one wholesaler in Gothenburg report that ”we

have twenty costumers in Europe and ten in Sweden … Large parts of sales go to the large fish markets in Hamburg, Bremen, Cuxhaven, Paris and Boulogne…. From Copenhagen to Italy people are eating pikeperch from Hjälmaren" (Ekegren and Persson, 2011 p. 88). The Stockholm auction is clearly a part of this international market. It is a digital auction with one third of pikeperch sales to foreign buyers and many national buyers at the auction are middle-men exporting to foreign markets.

Since higher prices are not motivating fishers to sell at the Stockholm auction other factors must matter. One important factor is the lower distribution costs. Stockholm is closer to Hjälmaren and Mälaren than Gothenburg resulting in lower transport costs per kilo of fish. Other cost-saving values such as closer personal contacts with a fish auction that is specialized in freshwater species could also matter. The Stockholm fish auction also provides services such as pick-up of fish for an extra fee, the possibility to announce catches in advance and the possibility to sell fish that has yet not been delivered to the auction where sellers and buyers agree upon a day of delivery in the future (Stockholms fiskauktion, 2019).

When we investigate how prices change for fish in Hjälmaren we find that direct buyers pay more for their fish after the establishment of the Stockholm auction. From a policy perspective higher prices is one factor that could increase the pressure on pikeperch stocks. Also, cost reductions such as lower transportation costs could increase the profitability of fishing and increase fishing effort. If proper management is not enforced higher prices or lower costs could increase the pressure on the stock and decrease it in the long run. Although stocks are considered sustainable today the advisory body recommends that catches are not further increased and in 2017 and 2018 catches were larger than in the preceding time period. Currently, there are no quotas set for fishing in Swedish lakes. The fisheries are regulated by licenses, gear permits and minimum catchable sizes. Although the number of licenses are

limited by the regulator each license holder could increase catches and put further pressure on stocks.

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