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A trip to reach the target? – The labor supply of Swedish Baltic cod fishermen☆

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ABSTRACT

This paper uses logbook data from Swedish Baltic Sea cod trawlers to investigate the revenue target hypothesis. Incomes from fishing can be highly variable and difficult to predict and it is possible that fishermen set specific revenue targets for their fishing trips to simplify decision making. In this paper a discrete choice stopping model is used where the fishermen must decide to stop or continue fishing after each haul. At average trip length, the results indicate that when revenues are higher than expected, fishermen are more likely to return to port. This is in line with the revenue target hypothesis. When using estimated revenue targets the results suggest that the effect of getting higher revenues than expected is stronger when the targets have been reached.

1. Introduction

Revenues from fishing are uncertain and vary on different trips, and even at different times on the same trip. Also, working hours for fishermen are irregular since a fishing trip can take many hours and often last for several days. Furthermore, many decisions on board a vessel can be made continuously through the trip, i.e. choice of fishing place, time of setting of trawls and decisions on how many hauls to make. This makes the fishing trip an ideal setting for investigating the idea of revenue targeting, i.e. investigating whether fishermen are aiming for specific short-term revenue targets rather than maximizing expected utility over a longer time period. The issue of revenue targeting in fisheries has been investigated previously, with the evidence being mainly in support of revenue target behavior (Giné et al., 2010; Eggert and Kahui 2012; Nguyen and Leung 2013; Ran et al., 2014), but there is also recent evidence disputing the idea of revenue targeting suggesting that fishermen substitute labor for leisure intertemporally (Stafford, 2015). Most previous studies on revenue targeting behavior in fisheries (Eggert and Kahui, 2012; Nguyen and Leung 2013; Stafford, 2015) use different versions of a model where time spent fishing is regressed on the log of earnings per time unit. These type of models implicitly assume that earnings remain constant during the period over which the revenue target is set. I believe that the assumption of constant earnings is unrealistic since incomes from fishing are highly variable even during the course of a fishing trip i.a. due to natural conditions. Instead, the discrete choice stopping model suggested by Farber (2005, 2008) is appropriate for investigating the revenue target hypothesis in fisheries.

The purpose of this article is to investigate revenue targeting behavior by relating labor supply of fishermen on Swedish Baltic Sea cod trawlers to changes in short-term unexpected revenues received during a fishing trip. More specifically, the effect of unexpected changes in revenues on the probability of stopping at the time of different hauls is investigated. A unique dataset that enables a detailed analysis of decision making after each haul is used. Using controls at a detailed level separates expected revenues from unexpected and enables me to interpret the results in line with the model of reference-dependent preferences suggested by Kőszegi and Rabin (2006) where a reference point is determined endogenously by the economic environment. Moreover, since the effect of unexpected revenue increases should be strongest at the point when the expected target has been reached, I estimate expected targets for the fishermen in the sample and investigate how the stopping decision is affected when reaching these targets.

Traditional labor market theory proposes that the amount of labor supplied in the long run is determined by substitution and income effects. Higher incomes will make workers substitute labor for leisure but they will also make workers richer and increase their demand for leisure, which in turn decreases the amount of time spent working. The effect of increasing incomes is thus indecisive in the traditional model. The traditional model can be contrasted with the revenue target hypothesis. The idea is that workers adapt their level of labor supply depending on whether they have reached a predetermined target level for their incomes in a specified, often very short time period.

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The idea of target revenues derives from prospect theory, which was introduced as an alternative to traditional expected utility theory by Kahneman and Tversky (1979). Prospect theory proposes that it is changes in income that matter rather than final wealth during a lifetime. Changes in welfare around a reference point are measured using a value function that is concave for gains and convex for losses, and is often steeper for losses than for gains. This implies that individuals are risk-averse for gains, risk-seeking for losses and that losing a sum of money is often worse than gaining the same amount (Kahneman and Tversky, 1979). The point at which losses are replaced by gains is the reference point, and in the context of revenue targeting this is a point that serves as a desirable short-term target for the individual (Camerer et al., 1997). The exact determination of the reference point is difficult but a reasonable definition is that targets are somehow related to the expectations held by individuals. Kőszegi and Rabin (2006) build on the ideas of Kahneman and Tversky and develop a theory that implies that targets are defined by probabilistic beliefs held by a person in the recent past. This allows targets to vary considerably between individuals and over time.

Potential constraints that could affect the decision to return to port and correlate with revenues are carefully considered in this study. Since fisheries might be constrained by government regulations (such as quotas) and the physical capacity of the vessels I will discuss how these constraints might influence the labor supply of fishermen.

2. Previous applications

There is a large number of studies investigating wage elasticities (a survey is found in Blundell and Macurdy (1999)). In general, the wage elasticities that are found are small, implying that labor supply is not very responsive to wage changes (Blundell and Macurdy, 1999). In empirical studies with short-term wage changes the long-term income effect from the traditional model is normally ignored since fluctuations in wages can be viewed as transitory. The substitution effect can in this case be viewed as temporal; it is beneficial to substitute labor for leisure when wages are high since lower wages are expected in the future. Thus, in the traditional model where there are no target revenues the expectation is that temporary increases in wages increase the supply of labor.

An empirical study that has received much attention is Camerer et al. (1997) studying reference targets of New York taxi drivers. The authors found that daily working hours for taxi drivers were negatively correlated with average hourly earnings, i.e. on average, taxi drivers worked shorter hours when wages were high. Together with the result that wages were correlated within days (so that drivers could expect more or less the same hourly wage during the day) and uncorrelated across days (to make sure wages were transitory across days) this was interpreted as evidence of a daily income target and as support for the ideas of prospect theory.

Some weaknesses of the Camerer et al. (1997) study have been pointed out by Farber (2005). One concern is that the correlation within days may not be applicable to other settings, which makes it difficult to use average income per hour as a dependent variable. Farber (2005) does not find any correlation within days in his study of New York taxi drivers in the period June 1999 through May 2001. Rather than using the wage equation, Farber (2005) suggests using an optimal stopping model where the probability of stopping on a day is estimated as a function of accumulated hours, accumulated revenues and other factors. Using accumulated variables makes it unlikely that a shift for the taxi driver would end because of a time-specific slowdown of traffic during the day. It also avoids the need for strong within-day wage correlation and reduces the risk of getting downward-biased estimates caused by measurement problems when using hours worked on both sides of the equation. Farber (2005) finds that the probability of stopping daily work after a particular trip is strongly related to the number of hours worked so far and not significantly related to cumulative income earned so far and concludes that these findings are not supportive of the target income hypothesis.

In 2008, Farber developed the stopping model further and assumed that revenue targets can vary across days for different taxi drivers (Farber, 2008). The results show that drivers are more likely to continue driving before the reference income level has been reached. But still Farber does not think that he had found any substantial evidence of the target income hypothesis since most taxi drivers stop before they reach their income target level and because the reference income level for a given driver varies unpredictably from day to day. In addition, a large unexplained within-driver variation in income is not believed to be in line with drivers having income targets. Using Farber's model, Doran (2014) analyzes the labor supply of taxi drivers in response to short-term and long-term wage increases. He finds that taxi drivers decrease hours in response to short-term wage increases but not to long-term wage increases. Thus, contrary to the conclusions of Farber (2005, 2008) he believes that he has found support for the reference-dependent behavior of taxi drivers.

The issue of how to determine reference points was not considered to any substantial extent in the early studies on reference dependence, but has been increasingly discussed in the last decade. Kőszegi and Rabin (2006) suggest that reference points are determined endogenously by the economic environment. For this reason the authors suggest a model where a reference point is formed by rational expectations held in the recent past. In an application they show that in a labor supply decision a worker is less likely to continue work if income earned so far is unexpectedly high, but more likely to show up as well as continue to work if expected income is high. Similar results are found in the empirical studies of Abeler et al. (2011) and Chang and Gross (2014). Kőszegi and Rabin (2006) also believe that the variation of targets found in Farber's work can be explained by their model of expectations. Crawford and Meng (2011) follow the approach in Kőszegi and Rabin (2006) and develop the empirical analysis made by Farber (2005, 2008) and present results that support the revenue target hypothesis for taxi drivers. In a recent analysis however (Farber, 2015), collecting data from all taxi drivers in New York during 2009–2013, Farber again claims that he cannot find any support for the idea of revenue targeting among taxi drivers. He finds that drivers work more in response to both expected and unexpected increases in wages and that the positive response grows with the experience of the drivers.

Since fishermen experience transitory changes in revenues and often have considerable flexibility regarding work hours there have been a number of studies using the approach of Camerer et al. (1997) to estimate labor supply in fisheries. Nguyen and Leung (2013) investigate revenue targeting in the Hawaii-based long-line fishery and estimate the effect of daily average revenue on the number of fishing days on a trip. The key finding is that daily fishing revenue has a negative and significant impact on the number of fishing days and these results are interpreted as support for the idea that Hawaiian fishermen have revenue targets. A similar study is that of Eggert and Kahui (2012) who discuss reference-dependent behavior of paua[1] divers in New Zealand and estimate the relationship between the number of hours that divers choose to work each day and the average daily wage. A negative relationship is again found here.

In contrast to the above studies, Stafford (2015) does not find that fishermen work less when earnings are high in her study on the daily labor supply of Florida lobster fishermen. She looks at the wage elasticity as well as the participation elasticity, i.e. the effect of wage on the probability of taking part in the fishery on a certain day, and takes econometric problems such as endogeneity of wages, self-selection into participation and measurement error in hours into consideration. Rather than finding a negative wage elasticity like Camerer et al. (1997) she finds that the wage elasticity of hours worked is significantly

[1] Paua is Maori for three types of edible sea snail.