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Subsidies, public goods, and external benefits in fisheries

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ABSTRACT

The fisheries subsidy discussion has largely overlooked the increased welfare for society from Pigouvian subsidies that increase the supply of and investment in public goods when there are external benefits and free riding. Important fisheries public goods and external benefits include knowledge associated with new technology for "target" species and "bycatch" reduction, research and development for new technology, and ecosystem services and biodiversity. Careful definition of subsidies also requires consideration of the counter-factual or what would have happened without the action to which the fishery "subsidy" is attributed. Subsidies in the Western and Central Pacific tuna fishery are evaluated according to these and other criteria.

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1. Introduction

Sumaila et al. [1] implicitly and explicitly raise several important issues about subsidies in fisheries, in particular those related to highly migratory species such as tuna and tuna-like species. This paper responds to particular points about subsidies for the tuna fisheries in the Western and Central Pacific Ocean (WCPO) and also raises several general points about fisheries subsidies for the direct production process that have been overlooked in the literature, notably external benefits from pure and impure public goods.[2]

The first main point is that when there is a relevant public good and corresponding external benefit, a Pigouvian subsidy increases economic welfare [2].[3] Examples include the knowledge externality with new harvesting technology for "target" species and "bycatch" reduction, research and development (R&D) to create new technology, and ecosystem services and biodiversity. Subsidies are then desirable from society's viewpoint. Second, there can be both a "bad" subsidy for the private part and a "good" Pigouvian subsidy for the public part of an impure public good and disentangling the two can be difficult.[4] Third, careful counterfactuals are required to define a "bad" subsidy, i.e. what would have happened *without* the action to which the "subsidy" is attributed. Fourth, conclusions depend upon which parties have standing[5] and whether all or part of an individual state's society or global society are given standing. Fifth, in isolation, a transfer payment may appear as a subsidy, but within the context of an international environmental agreement, the "subsidy" may be a side payment to insure that all parties gain and multilateral cooperation is achieved.[6] Sixth, when measuring subsidies, economic costs must be defined according to economic principles from welfare and public economics and cost-benefit analysis. Seventh, some "bad" subsidies are captured by Pacific Island Party (PIP) higher access and vessel day prices induced by increased distant water fishing nation (DWFN) demand due to the "bad" DWFN subsidies in the WCPO tuna fishery, i.e. a portion of the "bad" subsidy is transferred from DWFNs to PIPs through prices.

This paper starts with a brief literature review of fisheries subsidies for the production process. Section 3 discusses fisheries subsidies and external benefits. Section 4 briefly questions some of

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[2] *Public goods* are are *nonrival* (one party's consumption does not reduce the amount available to others) and *nonexcludable* (all parties have access to the good). Public goods range from *pure*, where the nonrivalry and nonexcludability are complete, to *impure*, where there is both private and public use and some rivalry and excludability [2]. An *externality* is the unintended and uncompensated impact of one consumer or firm's actions upon another's well-being or profitability. Public goods have a *positive externality*, i.e. an *external benefit*, the difference between a private party's and society's benefit. Because others enjoy public good benefits provided by a private party without having to pay for it, there is an external benefit and free riding, which leads to the privately provided public good less than economic optimum. *Free riding* refers to someone who benefits without paying the cost.

[3] A *Pigouvian tax* (*subsidy*) corrects an inefficient market outcome and equals the difference between the private and social marginal cost (benefit) of an activity, i.e. equal to the external cost (benefit) [2].

[4] "Bad"("good") subsidies lower (raise) society's economic welfare [2].

[5] *Standing* means whose costs and benefits count.

[6] A *side payment* made by one party in an agreement to another induces them to join the agreement. When the agreement leads to an aggregate gain, then the side payment leads to welfare enhancement.

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Sumaila et al.'s [1] subsidy measurements in the WCPO tuna fisheries, and through this discussion raises the issue of counterfactuals and capture of some subsidies for DWFNs in access fees and vessel day prices. Section 5 concludes.

2. Fisheries subsidies

FAO [3, p. 28] recently surveyed the field and defined fisheries subsidies as, "Fisheries subsidies are government actions or inactions that are specific to the fisheries industry and that modifies – by increasing or decreasing – the potential profits by the industry in the short-, medium- or long-term."

FAO [3, p. 28] also provided the following definition of the World Trade Organization (WTO) subsidy. "The WTO Agreement on Subsidies and Countervailing Measures (SCM) is also a commonly cited and practically applied subsidy definition. WTO definitions and rulings are important because in general international trade law trumps all other types of international law. The SCM Agreement is WTO's basic subsidy agreement and the one that currently governs trade disputes regarding the fisheries sector. It specifies that a subsidy exists if "there is a financial contribution by a government or any public body within the territory of a Member" and this contribution fulfills certain specified conditions, or if "there is any form of income or price support in the sense of Article XVI of GATT 1994". Moreover, benefits have to be conferred. For the subsidy to be offending, it also has to be "specific", "prohibited" or "actionable" and cause "adverse effect" (WTO 1994 Agreement on Subsidies and Countervailing Measures, article 1)."

Shrank and Keithly [4] discuss subsidies in the presence of externalities, but further discussion is required. References in Shrank and Keithly [4] and Sumaila et al. [1] give other influential fishery subsidies discussions. Almost all of the fisheries subsidy discussion has focused on private goods and "bad" subsidies.[7]

3. When are fisheries subsidies "good"?

Fisheries subsidies can have both positive and negative impacts on society's economic welfare, i.e. there are both "good" and "bad" subsidies. The perceived conventional wisdom is that there are two key negative economic impacts. First, subsidies lower private cost to producers, but society still bears the cost of the subsidy, so that the economic – as opposed to the private – cost of production to society is higher than the private cost to individual vessels or firms. The level of production, including the amount of the physical capital stock, is inefficient, with too many resources allocated to production (overcapacity) at an opportunity cost of foregone economic benefits from these over-allocated resources.[8] Second, when a binding sustainable catch target, such as a Total Allowable Catch (TAC), does not regulate a fishery, there can be increased fishing pressures on the resource. If the stock is overfished or overfishing occurs, then the negative effect is clear and there is an economic cost through foregone sustainable harvests and economic rents.[9] If the subsidy also induces adverse ecological impacts, such as unbalanced harvesting or higher "bycatch", there is an additional economic opportunity cost of foregone indirect use values for ecosystem services and biodiversity and foregone existence values. In simple terms, subsidies are considered to exacerbate the well documented commons problem of overfishing, overfished resource stocks, excessive economic inputs allocated to the sector, raising costs, lowering economic rents, and creating ecological damages, as well as distorting the price signals that allocate resources in a market economy.

The standard story is not always clear, however, when there are public goods and external benefits, in which case the private level of investment and provision is below the economic optimum.[10] Private producers and investors cannot capture all the total benefits from supplying the public good, because a public good is nonrival and nonexcludable (to varying degrees, depending upon its purity and whether or not there are patents, licenses, etc.) and there are external benefits and free riding [2]. Pigouvian subsidies equal to the amount of external benefits are then "good" subsidies leading to the economic and ecological optimum production and investment.

Fisheries production has an external benefit from a public good, technology and knowledge, which the subsidies debate has not acknowledged. Technology and knowledge are nonrival, and without patents and licenses[11] are also nonexcludable [6,7]. Fishers do not internalize externalities associated with the knowledge growth, i.e. fishers do not enjoy the full benefits. Technology externalities and market failures related to diffusion, learning from others (learning by using), and networks [9] are bundled into the aggregate knowledge externality upon which the paper focuses, since the paper considers an aggregate technology that abstracts from these additional individual externalities.

Technology for "target" species, although largely exogenously arising from outside of the harvesting sector [10,11], when it is embodied in physical capital is only adopted through the investment decisions of firms [6,7,10,11]. Technology then evolves endogenously within the sector as a result of these private investment decisions. An increase in a firm's physical capital stock leads to a parallel increase in its stock of knowledge. Each firm's knowledge is a public good and any other firm can thereby access it a zero or low cost. Knowledge thus spills over across the entire fishery. Changes in a firm's technology through private investment lead to increases in the fishery sector's overall stock of knowledge and learning, a public good.

Knowledge accumulation with technology, which includes accompanying learning, is a byproduct of accumulating physical capital embodied with technology and knowledge, and is a side effect of private investment decisions. Investment-specific knowledge and accompanying learning are thus proportional to the capital stock, and a given firm is more productive the higher the aggregate knowledge stock given the knowledge externality (spillovers). Because fishing firms are typically small enough to neglect their own contributions to the aggregate stocks of physical capital and knowledge and their contributions to the exploitation of common resources, they can be expected to treat all stocks (knowledge, common resource) as given, leading to the knowledge and common resource stock externalities. On the whole, few fishing firms purposefully invest in R&D to develop or acquire new technologies for harvesting "target" species (which would be endogenous technology).

From the point of view of technology users (without patents, licenses, etc.), investment-specific technology is treated as a pure

[7] *Private goods* are both excludable and rival, i.e. others can be excluded from consumption of the good and consumption of the good depletes it.

[8] *Opportunity cost* is the foregone next best alternative's value to the current action.

[9] *Overfished* stocks are below maximum sustainable yield (MSY) and *overfishing* is mortality greater than that of MSY.

[10] The exception is for "*best shot*" *public goods* [8]. The most effective provider supplies *best-shot* public goods, allowing unilateral supply and minimal free riding problems that make supply vulnerable, although there is considerable potential for free riding. Conservation technology available to all is an example, as recently demonstrated by a single country's development of circle hooks rather than J-hooks and mackerel-type in place of squid bait for swordfish longline harvesting.

[11] Patents and technology licenses for innovations allow the innovator to exclude others from use (eliminate or substantially reduce free riding) and thereby enjoy the benefits of innovation, bringing about the economic optimum.