Export Tax Rebate Policy in Chinese Fishery Sector: Who are the Beneficiaries?

X. Liu;

Qilu University of Technology, International Trade, China

Corresponding author email: xzl0030@auburn.edu

Abstract:

The export tax rebate policy in Chinese fishery sector is under dispute, as it is claimed that it works as a subsidy for foreign consumers rather than domestic producers. This paper investigates the distribution of benefits of this policy in the fishery sector. We find that the effects of the export tax rebate on domestic producers depend on the relative magnitude of the export supply and import demand elasticities. After applying the "best-bet" parameter values, simulation results indicate that, although the export tax rebate does improve Chinese producers' welfare, foreign consumers capture most of the welfare benefits of this policy (60%-75%). Furthermore, the results imply that the welfare gain for Chinese producers is overestimated if the vertical linkage between the retail and the farm markets is ignored.

Acknowledegment: We thank Dr. Henry Kinnucan at Auburn University for his helpful insight about the model. This work was supported by Shandong Social Science Research Project of China [grant number 16BCXJ04].

JEL Codes: F13, C63

#684

Export Tax Rebate Policy in Chinese Fishery Sector: Who are the Beneficiaries?

Abstract

The export tax rebate policy in Chinese fishery sector is under dispute, as it is claimed that it works as a subsidy for foreign consumers rather than domestic producers. This paper investigates the distribution of benefits of this policy in the fishery sector. We find that the effects of the export tax rebate on domestic producers depend on the relative magnitude of the export supply and import demand elasticities. After applying the "best-bet" parameter values, simulation results indicate that, although the export tax rebate does improve Chinese producers' welfare, foreign consumers capture most of the welfare benefits of this policy (60%-75%). Furthermore, the results imply that the welfare gain for Chinese producers is overestimated if the vertical linkage between the retail and the farm markets is ignored.

JEL classifications: Q17, F13, C63

Keywords: Fishery Sector; Export Tax Rebate; Welfare Distribution; Value-Added Tax; Retail market; Farm Market

1. Introduction

China has the largest production and exports of fishery products, which are an important part of China's agricultural exports. However, China's fishery products have low value added and a low profit margin due to the low technical content. Moreover, in recent years, the export firms have had to face the problem of appreciation of Chinese currency and the increasing costs of labor. In order to improve the competitiveness of Chinese fishery firms and increase their profits, the export tax rebate (ETR) rate for several types of fishery products[1] was increased from 5% to 13% in 2008. The export tax rebate policy enables the export companies to get partial or total refund for the indirect tax paid during the production and distribution processes. Under the World Trade Organization (WTO) rules, the ETR is not considered as a subsidy as long as the tax rebate does not overweigh the tax paid by companies.

However, there is a long-standing dispute regarding whether this policy should be retained or abolished in Chinese fishery sector. The view of most export firms is that such a policy not only gives firms higher profits, but also alleviates the poverty of the farm input producers due to the connection between the retail and farm markets. Nevertheless, many financial commentators have a different view. They point out that the ETR is stimulating the exports of fishery products by subsidizing foreign consumers and that domestic producers are actually getting few benefits. Thus, they claim that the ETR on the fishery sector results in a waste of taxpayers' money.

[1] They include frozen tilapia, frozen tilapia fillets, frozen crustacean, molluscs, etc.

Moreover, the theory suggests that an export promotion policy may be detrimental to domestic consumers' welfare. Therefore, it is important to address two questions: (i) who are the beneficiaries of the ETR in Chinese fishery sector, the foreign consumers, or the domestic producers; (ii) what affects the welfare distribution effects of such policy?

Despite the heated debate, the literature has rarely studied the above questions. Most of the literature focuses on whether the ETR improves the quantities of exports (Chao et al., 2001; Chandra and Long, 2013; Chen et al., 2006; Gourdon et al., 2017; Whalley and Wang, 2007), or how it affects the welfare of the whole economy (Brander and Spencer, 1985; Chi-Chur et al., 2006; Jarvis, 2012; Mai and Hwang, 1987; Yin and Yin, 2005). Few studies how the benefits are allocated among different groups in a specific sector. The purpose of this paper is to investigate the benefits distribution effect of the ETR on China's fishery sector. To this aim, we first use an equilibrium displacement model (EDM) to investigate the effects of the ETR on prices and trade flows. Then, following Sun and Kinnucan (2001), we compute the distribution of welfare changes for Chinese domestic producers, domestic consumers, and foreign consumers using the EDM simulation results.

Although the policy is implemented at the retail level, we also consider the farm level and the linkage between the two levels, as not considering such vertical linkage may produce inaccurate results. In this paper, Wohlgenant's (1989) method is followed in that the retail and the farm markets are linked through the retail price and the farm price. In this way, we are able to obtain not only more accurate results for the retail market, but also the benefits' allocation between producers of farm and non-farm inputs at the input level.

The paper proceeds as follows. The next section provides a graphical analysis. Section 3 presents the model used to simulate the effects of the ETR on China's fishery sector. Section 4 applies the "best-bet" parameter values to the model, discusses the price and quantity effects, and analyzes the welfare effects. Section 5 concludes.

2. Graphical Analysis

Consider a simplified situation in which retail producers purchase inputs from the farm market to produce goods and sell them in both domestic and export markets. An ETR is implemented in the retail market for the export goods. The fishery products are assumed to be homogeneous across both domestic and export markets[2], and the Law of One Price holds. The economy is large in that it affects the world price. There is no market power so that the competitive equilibrium can be reached. Ignoring all tariffs and other trade barriers, the effects of the ETR are indicated in Figure 1.

[Place Figure. 1 approximately here]

In absence of rebates, the intersection between the excess demand curve ED and the excess supply curve $ES(P_F^0)$ determines the original price P_R^0 for both

---

[2] Agricultural products, including seafood, are often assumed to be homogeneous products (Kilkenny 1998; Krugman 1990).

domestic and export markets. Instead, when there is an ETR, the excess supply curve moves from $ES(P_F^0)$ to $ES'(P_F^0)$. As shown in Panel B, without considering the linkage between farm and retail markets, the domestic price is increased to P_R'' and the export price is decreased to P_R^X. Therefore, the ETR causes a welfare loss for domestic consumers and a welfare gain for both domestic producers and foreign consumers. However, when the vertical linkage is taken into account, the increase of the excess supply enhances the demand for inputs and causes farm price to increase from P_F^0 to P_F', as shown in Panel C. A higher input price causes the retail supply curve to shift up, as shown in Panel A. The upward shift of the supply curve causes the export supply to shift up as well. Then, as shown in Panel B, the higher excess supply curve implies a higher domestic price and a higher export price. Thus, compared to the case without considering the vertical linkage, the ETR increases the domestic price to P_R' instead of P_R'', and decreases the export price to $P_R^{X\prime}$ instead of P_R^X. As a result, the quantity of exports is increased to X_R' instead of X_R''.

3. Model

In order to identify the beneficiaries of the ETR in Chinese fishery sector, the structural model that defines the initial equilibrium under the assumptions in Section 2 is as follows:

Retail market:

$D_R = D_R(P_R^D)$ (Domestic demand) (1)

$P_R^S = P_R^S(S_R, P_F, P_N)$ (Inverse supply) (2)

$X_R = X_R(P_R^X)$ (Export demand) (3)

$$P_R^D = P_R^S \cdot VAT \qquad \text{(Domestic price)} \qquad (4)$$

$$P_R^X = P_R^S \cdot VAT/ETR \qquad \text{(Export price)} \qquad (5)$$

$$S_R = D_R + X_R \qquad \text{(Market clearing)} \qquad (6)$$

Farm market:

$$P_F = P_F(D_F, P_R^S, P_N) \qquad \text{(Inverse demand)} \qquad (7)$$

$$S_F = S_F(P_F) \qquad \text{(Supply)} \qquad (8)$$

$$S_F = D_F \qquad \text{(Market clearing)} \qquad (9)$$

In this model for China, D_R and S_R are the retail-level domestic demand and supply, respectively; X_R is the retail-level export; P_R^D is the retail-level domestic demand price; P_R^X is the retail-level export price; P_R^S is the retail-level supply price; D_F and S_F are the farm-level demand and supply, respectively; and P_F is the farm-level price. The variables VAT and ETR represent the value-added tax (VAT) and the export tax rebate, respectively. They are both included in the model because they are closely related. For example, an isolated increase in VAT increases both domestic and export prices, while an isolated increase in ETR increases the domestic price and reduces the export price. Finally, P_N is the price of non-farm inputs. The retail- and farm-level markets are linked by the domestic retail-level supply equation and the farm-level demand equation. Overall, this model contains nine endogenous variables (D_R, S_R, X_R, P_R^D, P_R^X, P_R^S, D_F, S_F, and P_F) and three exogenous variables (VAT,

ETR, and P_N).[3]

By taking the total differential, the model can be written in the equilibrium displacement form, which characterizes the change in equilibrium prices and quantities from shifts in VAT and ETR, as follows:

Retail market:

$$D_R^* = \eta_R^D P_R^{D*} \tag{10}$$

$$P_R^{S*} = S_R^*/\varepsilon_R + \phi_{RF} P_F^* + \phi_{RN} P_N^* \tag{11}$$

$$X_R^* = \eta_R^X P_R^{X*} \tag{12}$$

$$P_R^{D*} = P_R^{S*} + VAT^* \tag{13}$$

$$P_R^{X*} = P_R^{S*} + VAT^* - ETR^* \tag{14}$$

$$S_R^* = k_D D_R^* + k_X X_R^* \tag{15}$$

Farm market:

$$P_F^* = D_F^*/\eta_F + \phi_{FR} P_R^{S*} + \phi_{FN} P_N^* \tag{16}$$

$$S_F^* = \varepsilon_F P_F^* \tag{17}$$

$$D_F^* = S_F^* \tag{18}$$

Here, the asterisked variables refer to approximate relative changes (e.g., $P_R^{D*} = dP_R^D/P_R^D$). Parameters are defined in Table 1. For normal sloping supply and demand curves, $\eta's < 0$ and $\varepsilon's > 0$.

The distribution of benefits brought by the ETR can be measured in two ways: by the pass-through of the ETR to Chinese producers and foreign consumers, and by the

[3] All other exogenous variables that may affect demand and supply are assumed to be constant, and hence are suppressed. P_N (e.g., the price of marketing service) is assumed to be exogenously given to simplify the derivation of the price transmission elasticities (see Appendix A for details).

welfare distribution among each group.

3.1 The pass-through of the export tax rebate

By imposing the market clearing conditions and dropping equations (12) and (14), China's export supply equation can be obtained as follows:

$$X_R^* = \varepsilon_R^X P_R^{S*} + \varepsilon_F^X P_F^* + \varepsilon_N^X P_N^* - (k_D \eta_R^D / k_X) VAT^*, \quad (19)$$

where $\varepsilon_R^X = (\varepsilon_R - k_D \eta_R^D)/k_X$ is China's export supply elasticity with respect to the retail supply price. For normal parameter values, $\varepsilon_R^X > 0$, indicating that the increase in the supply price increases the export supply to the international market. $\varepsilon_F^X = -\phi_{RF}\varepsilon_R/k_X$ and $\varepsilon_N^X = -\phi_{RN}\varepsilon_R/k_X$ are the export supply elasticities with respect to the farm price and the price of non-farm inputs, respectively. Both of them are negative, implying that a higher input price reduces the export supply. The VAT's effects on the export supply is indicated by $-k_D \eta_R^D / k_X$, which takes positive values. This means that a higher VAT on the retail domestic market enhances the export supply.

Then, by equalizing equations (19) and (12) and substituting (14), the retail supply price can be obtained:

$$P_R^{S*} = -\{(k_X \eta_R^X + k_D \eta_R^D)/[k_X(\eta_R^X - \varepsilon_R^X)]\} VAT^* + [\eta_R^X/(\eta_R^X - \varepsilon_R^X)]\, ETR^*$$
$$+ [\varepsilon_F^X/(\eta_R^X - \varepsilon_R^X)\,] P_F^* + [\varepsilon_N^X/(\eta_R^X - \varepsilon_R^X)] P_N^*. \quad (20)$$

When the linkage between the farm and the retail markets is not considered, the reduced form of the elasticity of supply price with respect to the ETR is represented by $\eta_R^X/(\eta_R^X - \varepsilon_R^X)$, which is restricted to be a positive value, indicating that an ETR on the export products causes the supply price to move up. Hence, the effect of the tax rebate on the supply price is determined by the relative magnitude of the export demand and supply elasticities. When the domestic producers face a perfectly elastic export demand curve or a perfectly inelastic export supply curve, then $\eta_R^X/(\eta_R^X - \varepsilon_R^X) = 1$. This means that the ETR is completely passed through to Chinese producers, and thus it has the largest possible effect. In contrast, when China has a perfectly elastic export supply curve or a perfectly inelastic export demand curve, $\eta_R^X/(\eta_R^X - \varepsilon_R^X) = 0$, that is, the tax rebate has no impact on domestic producers. As derived above, $\varepsilon_R^X = (\varepsilon_R - k_D\eta_R^D)/k_X$, indicating that a larger retail supply elasticity, domestic demand elasticity or a larger market share of the domestic market increases the export supply elasticity, and thus attenuates the effectiveness of the ETR. This result is consistent with the study by Ishikawa and Kuroda (2007), which finds that whether or not an export promotion policy improves the welfare of the export country may depend on the slope of the inverse demand curve and the market share.

If, instead, the linkage between the farm and retail markets is taken into consideration, the reduced-form supply price is as follows:

$$P_R^{S*} = -\{(k_X\eta_R^X + k_D\eta_R^D)/[k_X(\eta_R^X - \varepsilon_R^X + \xi)]\}VAT^*$$
$$+[\eta_R^X/(\eta_R^X - \varepsilon_R^X + \xi)]\,ETR^* + \{\varepsilon_N^X/[(\eta_R^X - \varepsilon_R^X)(\eta_R^X - \varepsilon_R^X + \xi)]\}P_N^*, \qquad (21)$$

where $\xi = (\varepsilon_F^X\phi_{FR}\eta_F)/(\eta_F - \varepsilon_F) > 0$, suggesting that, as indicated in Figure 1, after considering the farm-retail linkage, the effects of the ETR on Chinese producers' supply price become larger.

Turning to the effects of this policy on the farm price, the relationship between the farm and the retail supply prices can be obtained by imposing the market clearing condition in the farm market:

$$P_F^* = [(\phi_{FR}\eta_F)/(\eta_F - \varepsilon_F)]P_R^{S*} + [(\phi_{FN}\eta_F)/(\eta_F - \varepsilon_F)]P_N^*, \quad (22)$$

where the coefficient $[(\phi_{FN}\eta_F)/(\eta_F - \varepsilon_F)] > 0$, indicating that the effects of a VAT or an ETR on the farm price are in the same direction as the effects on the retail supply price. Therefore, an increase in the VAT in the export market depresses the farm price. In other words, the farm price can be increased by an ETR. For the farm price, the effectiveness of the ETR is determined not only by the relative magnitude of the demand and supply elasticities of export and by the market shares, but also by the relative magnitude of the demand and supply elasticities at the farm level and the price transmission elasticity from the retail market to the farm market. A higher price transmission elasticity implies a larger effect of the ETR on the farm price. Since $0 < [\eta_F/(\eta_F - \varepsilon_F)] < 1$, $[(\phi_{FR}\eta_F)/(\eta_F - \varepsilon_F)]$ has an upper limit of ϕ_{FR} and a lower limit of 0.

3.2 The measure for welfare

According to Alston et al. (1995), in a multi-stage market, the measurement of welfare change is not affected by the choice of the market level to be measured. To avoid double counting, in this paper, we choose the retail market to measure welfare changes in the industry. Following Sun and Kinnucan (2001), by assuming parallel shifts of demand and supply curves, the welfare changes for Chinese domestic producers, domestic consumers, and foreign consumers are approximated by the following formulas:

$$\Delta CS_D = -P_R^0 D_R^0 P_R^{D*}(1 + 0.5D_R^*) \quad (23)$$

$$\Delta PS_D = -P_R^0 S_R^0 (V_S - P_R^{S*})(1 + 0.5S_R^*) \quad (24)$$

$$\Delta CS_X = -P_R^0 X_R^0 P_R^{X*}(1 + 0.5X_R^*), \quad (25)$$

where ΔCS_D is the change in domestic consumer surplus associated with the ETR changes; ΔPS_D is the change in producer surplus at the retail level; and ΔCS_X is the change in the foreign consumer surplus due to a change in the ETR. Moreover, $P_R^0 D_R^0$ is the retail-level domestic consumer expenditure in the initial equilibrium; $P_R^0 S_R^0$ is the total revenue of Chinese producers for both domestic and export markets in the initial equilibrium; and $P_R^0 X_R^0$ is the foreign consumer expenditure on Chinese fishery products. P_R^{D*}, P_R^{S*}, and P_R^{X*} are the relative changes in retail-level domestic demand price, supply price, and export price, respectively. Similarly, D_R^*, S_R^*, and X_R^* are the relative changes in retail-level domestic demand, total supply, and exports associated with the changes in the ETR, respectively. Finally, V_S is the percentage change in the retail price when the changes in both quantity and non-farm price equal zero.

As mentioned before, considering a multi-stage market allows us not only to represent a more realistic setting, but also to obtain the producer surplus changes in the farm market as follows:

$$\Delta PS_F = P_F^0 S_F^0 P_F^*(1 + 0.5S_F^*), \quad (26)$$

where ΔPS_F is the change in farm producer surplus associated with a change in the ETR; $P_F^0 S_F^0$ is the revenue of farm producers in the initial equilibrium; P_F^* is the relative change in the farm price; and S_F^* is the relative change in farm supply. V_D is the percentage change in the farm price when the changes in both quantity and non-farm input price equal zero.

4. Simulation

In this section, the "best-bet" parameter values are applied to the model above to simulate how welfare benefits or losses are distributed among different groups. Specifically, we address three issues: (i) the pass-through of the ETR; (ii) the distribution of welfare gains and losses among Chinese producers, Chinese consumers, and foreign consumers; and (iii) the distribution of welfare between producers of farm and non-farm inputs. Two scenarios are considered, depending on whether the vertical linkage between farm and retail markets is considered or not (Scenario 1 and Scenario 2, respectively).

4.1 Parameterization

The empirical literature is surveyed to determine or derive the "best-bet" values for the numerical values of the elasticities of demand, supply, and price transmission. These values, combined with other necessary data in Table 1, are then used to simulate the effects of the VAT and ETR on prices, trade flows, and welfare distribution in China's fishery sector. Among the parameter values, there is a large variation in the value of domestic demand elasticity reported by different studies. Thus, a sensitivity analysis is performed by considering alternative values of this parameter to determine sensitivity, and to highlight the finding in Section 3 that a higher domestic demand elasticity (which implies a higher export supply elasticity) impairs the effectiveness of the ETR policy.

4.2 Simulation Results

4.2.1 Pass-through of the export tax rebate

The reduced-form elasticities indicate how an endogenous variable changes in response to a change in an exogenous variable allowing other endogenous variables in the model to adjust. The incidence of the ETR in the Chinese fishery sector is shown in Table 2. For example, the reduced-form elasticity of the domestic supply price with respect to the ETR indicates the percentage change in the supply price associated with a percent change in the ETR. As mentioned before, $\xi > 0$ means that the linkage between farm and retail markets is considered. Since the non-farm price P_N^* is used to derive the parameters, we will not discuss its effects.

Focusing first on the retail market, when $\xi > 0$, a 1% increase in the VAT is split between a 0.13%-0.55% increase in export price (as well as domestic demand price) and a 0.45%-0.87% decrease in the Chinese supply price. Chinese producers have a heavier burden as the domestic demand elasticity rises. The higher domestic demand price reduces the quantity demanded in the domestic market by about 0.17%-0.21%. The lower supply price reduces the quantity of supply by about 0.17%-0.21%.

When it comes to the effects of the ETR, Table 2 shows that a 1% increase in the ETR is split between a 0.05%-0.09% increase in the retail supply price and a 0.91%-0.95% decrease in the export price. In other words, the ETR has a much larger effect on reducing the foreign consumers' price than on improving the domestic producers' one. As a result, the quantity of export is increased by 0.86%-0.90%, whereas the quantity of supply is only increased by at most 0.04%.

As the sensitivity analysis suggests, the domestic producers' benefits are getting smaller when the domestic demand becomes more price elastic, which makes the export supply elasticity become larger. This highlights the fact that the positive effect of the ETR on the supply price depends on the relative magnitude of the export supply and the export demand elasticities. Specifically, if the export supply elasticity is much larger than the export demand elasticity, an ETR has a small effect on increasing the supply price, but a large one on reducing the export price.

Then, focusing on the farm market, an increase in VAT reduces the quantity of supply at the retail level, and thus depresses the price at the farm level and reduces the quantity of farm supply and demand. On the other hand, a 1% increase in ETR increases the farm quantity by 0.03% (which is insensitive to the change of η_d), and increases the farm price by 0.04-0.06%. Based on the foregoing in Section 3, the reason for such results is clear: the retail supply is enlarged by an ETR, and thus quantity and price for the farm inputs are also enhanced.

Results of Scenario 2 are also shown in Table 2. The comparison implies that, as indicated in Section 3, the change in the domestic supply price will be underestimated if the vertical linkage is not considered. However, the supply quantity will be overestimated; thus, the welfare effects of not considering the farm-retail linkage are ambiguous, which will be discussed in detail in Section 4.2.2.

4.2.2 Distribution of the welfare gains

In order to simulate the distribution of welfare gains caused by the changes in

ETR, inserting the reduced-form elasticities in Table 2 into equations (23)-(25) yields:

$$\Delta CS_D = -P_R^0 D_R^0 [(P_R^{D*}/ETR^*)ETR^*][1 + (0.5D_R^*/ETR^*)ETR^*] \quad (27)$$

$$\Delta PS_D = -P_R^0 S_R^0 [V_S - (P_R^{S*}/ETR^*)ETR^*][1 + (0.5S_R^*/ETR^*)ETR^*] \quad (28)$$

$$\Delta CS_X = -P_R^0 X_R^0 [(P_R^{X*}/ETR^*)ETR^*][1 + (0.5X_R^*/ETR^*)ETR^*], \quad (29)$$

where P_R^{D*}/ETR^*, P_R^{S*}/ETR^*, P_R^{X*}/ETR^*, D_R^*/ETR^*, S_R^*/ETR^*, and X_R^*/ETR^* are set equal to the corresponding reduced-form elasticities given in Table 2.

The "best-bet" measure of the welfare changes is presented in Table 3. All results are for a 1% increase in the ETR. The third, fifth, and seventh columns show how an increase in welfare is distributed between Chinese producers and foreign consumers. Generally, under both scenarios, the total welfare gains (TWG) range from 32.93-42.61 million dollars, most of which go to foreign consumers (60%-75% of TWG under Scenario 1, and 57%-73% under scenario 2). This implies that, as highlighted by some financial commentators and taxpayers, with the "best-bet" parameter values, the ETR policy in the Chinese fishery sector is subsidizing foreign consumers more than domestic producers.

The value and percentage of the benefits for Chinese producers are enhanced without considering the farm-retail connection, but such increment is not sufficient to affect the conclusion that foreign consumers are the major beneficiaries. The comparison between the two scenarios indicates that if we do not consider the farm market, the simulation results on values and percentage of domestic producer gains would be overestimated, and the loss for Chinese consumers would be underestimated.

This sheds light on the importance of considering the farm-retail linkage even when the input markets are not of interest.

The sensitivity analysis shows that the total welfare gains are increasing with the growth of the domestic demand elasticity with respect to price. Under both scenarios, the gains for domestic producers and the loss for domestic consumers are both decreasing when the domestic demand becomes more price elastic (which makes the export supply become more elastic as well). This is consistent with Section 3, in which we conclude that as the export supply elasticity rises, ceteris paribus, we expect the effects of the ETR on domestic producers to decline. Therefore, reducing the export supply elasticity (e.g., by improving the reliance on imports to reduce the domestic demand elasticity) may be helpful to enhance the effectiveness of the ETR.

Dividing the welfare measurements of Scenario 1 in Table 3 by 25.11 million dollars (the government spending corresponding to a 1% increase in the ETR) yields the marginal benefit-cost ratios (MBCRs) shown in Table 4.

The results for $MBCR_1$ suggest that the total welfare gains overweigh the government expenditure if TWG is considered as the "benefits" of this policy. $MBCR_1$ increases with a reduction in η_d. However, as discussed, the total welfare gains are shared between domestic producers and foreign consumers, and with the "best-bet" elasticities, the latter obtain most of the benefits. Only in the extreme cases where the export demand elasticity approaches 1 or the export supply elasticity approaches 0 can the entire ETR be passed on to Chinese producers. Therefore, the results for $MBCR_2$ are of more interest to us. When the domestic demand elasticity is between -0.31 to -1.40, $MBCR_2$ ranges from 0.33 to 0.63. We also compute $MBCR_3$, which takes the Chinese consumer surplus into account, as Kinnucan and Cai (2011) state that, when analyzing the effectiveness of a trade promotion policy, the so called "societal MBCRs" should not be ignored, for they indicate the effectiveness from a societal perspective, instead of an industry one. The results imply that when $MBCR_1$ equals 1.31-1.56, $MBCR_3$ approximates 0, due to the fact that the benefits for domestic producers are almost completely offset by the loss for domestic consumers.

According to Alston and James (2002), the changes in retail-level producer surplus equal the sum of changes in the producer surplus for all inputs. Thus, considering the farm-retail linkage enables us to obtain the distribution of the welfare gains for Chinese producers between farm and non-farm input producers. To this aim, we rewrite equation (26) as follows, and then compute the welfare changes of both inputs with equation (30) and the results for ΔPS_D in Table 3. The results are presented in Table 5.

$$\Delta PS_F = P_F^0 S_F^0[(P_F^*/ETR^*)ETR^*][1 + (0.5S_F^*/ETR^*)ETR^*], \quad (30)$$

where P_F^*/ETR^* and S_F^*/ETR^* are set equal to the corresponding reduced-form elasticities given in Table 2.

Table 5 indicates that the welfare distribution between producers of farm and non-farm inputs[4] is very sensitive to the variation of η_d. Farmers' share of the welfare gains improves dramatically with the increase in China's domestic demand

[4] It is impossible to compute the welfare distribution among producers of different non-farm inputs in the current framework.

elasticity in the fishery sector. As the domestic demand becomes more price elastic, producers of farm inputs gradually become the biggest winners at the input markets. When η_d ranges from -0.31 to -1.40, farmers obtain 7.32 to 9.26 million dollars, accounting for 46% to 99% of the total producer surplus.

5. Concluding Comments

The dispute over whether the export tax rebate in Chinese fishery sector should be kept or not has been existing for years. The literature focuses more on whether this policy improves the quantity of exports or not. Few studies have investigated the welfare distribution or benefits allocation among different groups. From an industry perspective, the ETR is considered effective if it increases producer surplus. However, is it possible that most of the benefits of this policy are captured by foreign consumers? What are the expenses domestic consumers have to bear? Moreover, how does such a policy affect the farm and non-farm input producers?

Based on an equilibrium displacement model, this paper tries to answer the above questions from a partial equilibrium perspective. It emphasizes the importance of taking into consideration the linkage between the retail and the farm markets. The derivation of the reduced form indicates that without considering this linkage, the effects on the Chinese supply price may be underestimated, whereas the effects on the welfare gains for Chinese producers may be overestimated.

This paper finds that the effectiveness of the ETR on domestic producers of Chinese fishery sector depends on the relative magnitude of the export supply and demand elasticities. When the export supply elasticity is relatively large, the effects of an ETR are very limited. Applying the "best-bet" parameters to the equilibrium displacement model, we find that when the ETR is increased by 1%, the export price is decreased by 0.91%-0.95%, while the Chinese retail supply price is only increased by 0.05%-0.09%. Although the total welfare gains overweigh the cost for the government, most of the gains go to foreign consumers. This suggests that in the Chinese fishery sector, although the ETR increases the supply price at both market levels and thus improves producers' welfare, it works more to subsidize foreign consumers than to support domestic producers.

The welfare loss for Chinese consumers is also considered in this paper. According to Gardner's (1983) criterion[5], China's ETR policy is efficient (under Scenario 1, dPS/dCS approaches 1.00). Nevertheless, from a societal perspective, the marginal benefit-cost ratio is almost zero.

We also compute the benefits allocation between farm and non-farm input producers. Simulation results suggest that the allocation is sensitive to variations in the domestic demand elasticity. Although a rise in η_d attenuates the total welfare gains for Chinese producers, farm producers' benefits are increased.

A caveat in interpreting our results is that our simulation is based on the "best-bet" parameters, and that we assume the price of non-farm inputs (e.g., marketing service) is exogenous. However, it does not affect our conclusion that a relatively larger export supply elasticity attenuates the effectiveness of the export tax

[5] Gardner (1983) states that, when dPS/dCS approaches 1.00, the deadweight loss per dollar of consumers' welfare transferred to producers is zero at the margin, thus the policy designed to benefit producers is considered efficient.

rebate policy in Chinese fishery sector. Our derivation indicates that the export supply elasticity is determined by the elasticities of supply and domestic demand, and by the market shares. For example, the larger the share of the domestic market, the higher the export supply elasticity. Although China is one of the most important exporters of fishery products, considering the much larger share of the domestic market, it is no wonder that China has a large export supply elasticity. This may help to explain why the ETR works more like a subsidy to foreign consumers.

Appendix A. Derivation of Price Transmission Elasticities

In a two-input, one-output demand and supply system, the output supply and the input demand functions are given by:

$$S_R = S_R(P_R^S, P_F, P_N) \tag{A.1}$$

$$D_F = D_F(P_R^S, P_F, P_N) \tag{A.2}$$

$$D_N = D_N(P_R^S, P_F, P_N) \tag{A.3}$$

By taking the logarithmic total differential of the first two equations we get:

$$dlnS_R = \varepsilon_R dlnP_R^S + \varepsilon_{RF} dlnP_F + \varepsilon_{RN} dlnP_N \tag{A.4}$$

and

$$dlnD_F = \eta_{FR} dlnP_R^S + \eta_F dlnP_F + \eta_{FN} dlnP_N. \tag{A.5}$$

Thus, we get equations as follows:

$$\phi_{RF} = \partial lnP_R^S / \partial lnP_F = |\varepsilon_{RF}| / \varepsilon_R \tag{A.6}$$

and

$$\phi_{FR} = \partial lnP_F / \partial lnP_R^S = \eta_{FR} / |\eta_F|, \tag{A.7}$$

where ε_{RF} and η_{FR} are the elasticity of retail supply with respect to the farm price and the elasticity of farm demand with respect to the retail price, respectively. To obtain the values of ε_{RF} and η_{FR}, the above demand and supply system can be written as:

$$S_R^* = \varepsilon_R P_R^{S*} + \varepsilon_{RF} P_F^* + \varepsilon_{RN} P_N^* \tag{A.8}$$

$$D_F^* = \eta_{FR} P_R^{S*} + \eta_F P_F^* + \eta_{FN} P_N^* \tag{A.9}$$

$$D_N^* = \eta_{NR} P_R^{S*} + \eta_{NF} P_F^* + \eta_N P_N^* \tag{A.10}$$

With the restrictions of homogeneity and symmetry:

$$\varepsilon_R + \varepsilon_{RF} + \varepsilon_{RN} = 0 \tag{A.11}$$

$$\eta_{FR} + \eta_F + \eta_{FN} = 0 \tag{A.12}$$

$$\eta_{NR} + \eta_{NF} + \eta_N = 0 \tag{A.13}$$

$$\varepsilon_{RF}/\eta_{FR} = -P_F F/P_R R \tag{A.14}$$

$$\varepsilon_{RN}/\eta_{NR} = -P_N N/P_R R \tag{A.15}$$

$$\eta_{FN}/\eta_{NF} = P_N N/P_F F \tag{A.16}$$

Together with the values of ε_R, η_F, and η_N, the values of ε_{RF} and η_{FR} can be obtained.

References

Alston, J. M., James, J. S., 2002. The incidence of agricultural policy. Handb. Agric. Econ. 2, 1689-1749.

Alston, J. M., Norton, G. W., Pardey, Philip G., 1995. *Science Under Scarcity.* CAB International. Wallingford, Oxon, UK.

Brander, J. A., Spencer, B. J., 1985. Export subsidies and international market share rivalry. J. Int. Econ. 18(1), 83-100.

Chandra, P., Long, C., 2013. VAT rebates and export performance in China: Firm-level evidence. J. Public Econ. 102, 13-22.

Chao, C. C., Chou, W. L., Eden, S. H., 2001, Export duty rebates and export performance: theory and China's experience. J. Comp. Econ. 29(2), 314-326.

Chen, C. H., Mai, C. C., Yu, H. C., 2006. The effect of export tax rebates on export performance: Theory and evidence from China. China Econ. Rev. 17(2), 226-235.

Dey, M. M., 2008. Strategies and options for increasing and sustaining fisheries and aquaculture production to benefit poorer households in Asia. No. 1823. WorldFish, 2008.

Gardner, B. L., 1983. Efficient redistribution through commodity markets. Am. J. Agric. Econ. 65(2), 225-234.

Gourdon, J., Monjon, S., Poncet, S., 2017. Incomplete VAT rebates to exporters : how do they affect China's export performance? Available at . https://hal.archives-ouvertes.fr/hal-01496998/document.

Graham, P., Klijn, N., Cox, A., Stokes, A., Hartmann, J., 1998. Modeling seafood trade liberalisation in the APEC region. IXth Biennial Conference of the International. Institute of Fisheries Economics and Trade. Tromsø, Norway, 1998. 8-11.

Han, T., Cramer, G. L., Whal, T. I., 1997. Rural household food consumption in China: Evidence from the rural household survey. WAEA Meeting, Reno, NY, 1997 July 13-16.

Ishikawa, J., Kuroda, T., 2007. Export subsidies versus export quotas with incompletely informed policy makers. Jpn. Econ. Rev. 58(1), 118–126.

Jarvis, L. S., 2012. The welfare implications of Brazil's coffee export price subsidies during the ICA. Agric. Econ. 43, 19-32.

Kilkenny, M., 1998. Transport costs and rural development. J. Reg. Sci. 38(2), 293-312.

Kinnucan, H. W., Cai, H., 2011. A benefit-cost analysis of US agricultural trade promotion. Am. J. Agric. Econ. 93(1), 194-208.

Krugman, P., 1990. Increasing returns and economic geography. No. w3275. National Bureau of economic research.

Ma, H., Rae, A., Huang, J., Rozelle, S., 2004. Chinese animal product consumption in the 1990s. Aust. J. Agric. Res. Econ. 48(4), 569-590.

Mai, C. C., Hwang, H., 1987. Domestic export subsidy and foreign welfare. Econ. Lett. 23(2), 185-188.

Sun, C., Kinnucan, H. W., 2001. Economic impact of environmental regulations on southern softwood stumpage markets: a reappraisal. Southern J. Appl. For. 25(3), 108-115.

Tewari, D. D., 2003. *Principles of Microeconomics*. New Age International. New Delhi.

Whalley, J., Wang, L., 2007. The unified enterprise tax and SOEs in China (No. w12899). National Bureau of Economic Research.

Wohlgenant, M. K., 1989. Demand for farm output in a complete system of demand functions. Am. J. Agric. Econ. 71(2), 241-252.

Yin, X., Yin, X., 2005. Can developing countries benefit from export promotion?. J. Econ Stud. 32(1). 60-80.

FIGURES

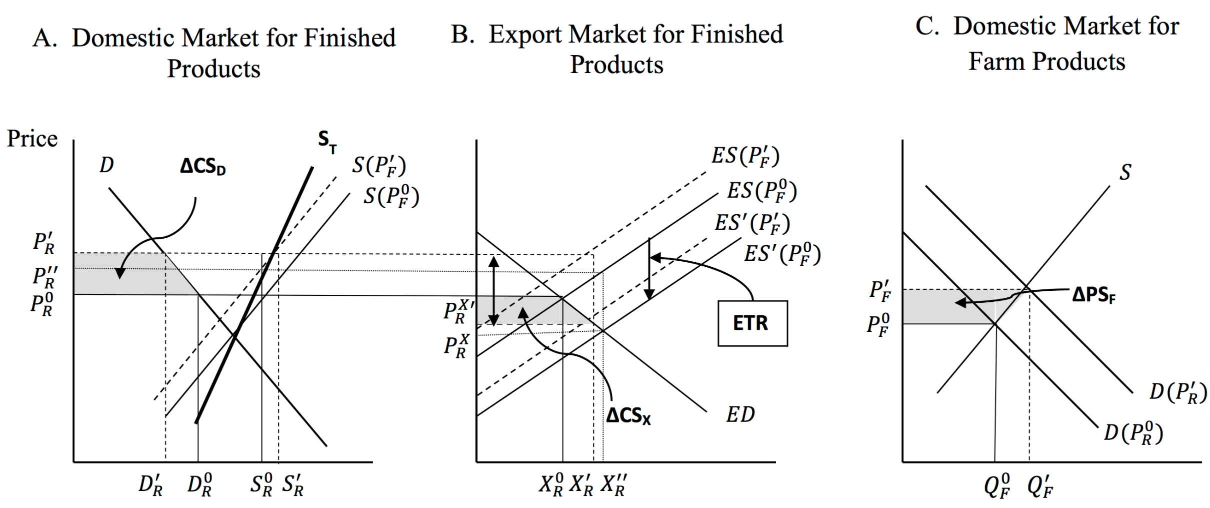

Figure. 1. Welfare effects of an ETR in the fishery sector.

TABLES

Table 1
Baseline data and model parameters.

Item	Definition	Value
η_R^D	Retail-level domestic demand elasticity	-0.31, -0.80, -1.40 [a]
ε_R	Retail-level supply elasticity	0.67 [b]
η_R^X	Retail-level export demand elasticity	-0.95 [c]
η_F	Elasticity of demand for farm inputs	-0.27, -0.70, -1.23 [d]
ε_F	Farm-level supply elasticity	0.59 [d]
ϕ_{RF}	Price transmission elasticity from the farm market to the retail market	0.81[e]
ϕ_{FR}	Price transmission elasticity from the retail market to the farm market	1.26 [e]
k_D	Retail-level domestic quantity share (=D_R/S_R)	0.92 [f]
k_X	Retail-level export quantity share (=X_R/S_R)	0.08 [f]
$P_R^0 S_R^0$	Total revenue of retail-level producers	25130 [g]
$P_R^0 D_R^0$	Retail-level domestic consumer expenditure	22640 [g]
$P_R^0 X_R^0$	Foreign consumer expenditure on Chinese fishery products	2490 [g]
$P_F^0 D_F^0$	Total expenditure on farm-level products	16780 [g]
$P_F^0 S_F^0$	Total revenue of farm-level producers	16780 [g]
V_D	Percentage change in the farm price when D_F^* and P_N^* equal zero	0.001 [h]
V_S	Percentage change in the retail price when S_R^* and P_N^* equal zero	0.0004 [h]

Sources:

[a] Taken from Han et al. (1997), Dey (2008), and Ma et al. (2004), respectively. See Section 4.1 for

details.

[b] Taken from Dey (2008).

[c] Taken from Graham et al. (1998).

[d] Computed based on Tewari (2003): as η_R^D changes, η_F varies too.

[e] See Appendix A for details.

[f] Taken from the Chinese Yearbook of Fishery Statistics (2014) and the United Nations Commodity Trade Statistics Database.

[g] Taken from the Chinese Yearbook of Fishery Statistics (2014) and the Report of the Ministry of Agriculture of China. All data include tilapia, crustacean, and molluscs. Unit: million dollars.

[h] Computed based on the formulas in Sun and Kinnucan (2000).

Table 2
Reduced-form elasticities.

Endogenous Variable	Exogenous Variable					
	VAT^*	ETR^*	VAT^*	ETR^*	VAT^*	ETR^*
$\xi > 0$						
	$\eta_d = -0.31$		$\eta_d = -0.80$		$\eta_d = -1.40$	
D_R^*	-0.17	-0.03	-0.21	-0.06	-0.18	-0.07
S_R^*	-0.20	0.04	-0.21	0.02	-0.17	0.01
X_R^*	-0.53	0.86	-0.25	0.88	-0.12	0.90
P_R^{D*}	0.55	0.09	0.26	0.07	0.13	0.05
P_R^{X*}	0.55	-0.91	0.26	-0.93	0.13	-0.95
P_R^{S*}	-0.45	0.09	-0.74	0.07	-0.87	0.05
D_F^*	-0.12	0.03	-0.35	0.03	-0.51	0.03
S_F^*	-0.12	0.03	-0.35	0.03	-0.51	0.03
P_F^*	-0.21	0.04	-0.59	0.06	-0.87	0.05
$\xi = 0$						
	$\eta_d = -0.31$		$\eta_d = -0.80$		$\eta_d = -1.40$	
D_R^*	-0.20	-0.02	-0.36	-0.04	-0.36	-0.04
S_R^*	-0.23	0.05	-0.37	0.03	-0.37	0.03
X_R^*	-0.62	0.88	-0.43	0.90	-0.43	0.90
P_R^{D*}	0.65	0.07	0.45	0.05	0.45	0.05
P_R^{X*}	0.65	-0.93	0.45	-0.95	0.45	-0.95
P_R^{S*}	-0.35	0.07	-0.55	0.05	-0.55	0.05

Table 3
Welfare distribution at the retail level (million dollars).

Item	Welfare Changes	Share of Gains	Welfare Changes	Share of Gains	Welfare Changes	Share of Gains
$\xi > 0$	$\eta_d = -0.31$		$\eta_d = -0.80$		$\eta_d = -1.40$	
ΔPS_D	15.75	40%	11.58	32%	8.17	25%
ΔCS_X	23.53	60%	24.21	68%	24.76	75%
ΔCS_D	-15.74	-	-11.58	-	-8.17	-
TWG	39.28	1.00	35.79	1.00	32.93	1.00
$\xi = 0$	$\eta_d = -0.31$		$\eta_d = -0.80$		$\eta_d = -1.40$	
ΔPS_D	18.53	43%	12.89	34%	9.39	27%
ΔCS_X	24.08	57%	24.69	66%	25.07	73%
ΔCS_D	-12.37	-	-8.60	-	-6.27	-
TWG	42.61	1.00	37.58	1.00	34.46	1.00

Note: TWG represents total welfare gains, $TWG = \Delta PS_D + \Delta CS_X$
$share\ of\ gains = \Delta PS_D (or\ \Delta CS_X)/TWG$

Table 4
Marginal benefit-cost ratios for a 1% increase in the ETR in the Chinese fishery sector.

η_d	$MBCR_1$	$MBCR_2$	$MBCR_3$
-0.31	1.56	0.63	Approximately 0
-0.80	1.43	0.46	Approximately 0
-1.40	1.31	0.33	Approximately 0

Note: $MBCR_1 = TWG/25.11$; $MBCR_2 = \Delta PS_D/25.11$; $MBCR_3 = (\Delta PS_D + \Delta CS_D)/25.11$.

Table 5
Welfare distribution at the input level (million dollars).

Item	Welfare Changes	Share of Gains	Welfare Changes	Share of Gains	Welfare Changes	Share of Gains
	$\eta_d = -0.31$		$\eta_d = -0.80$		$\eta_d = -1.40$	
ΔPS_F	7.32	46%	9.26	80%	8.12	99%
ΔPS_N	8.43	54%	2.32	20%	0.05	1%
ΔPS_D	15.75	1.00	11.58	1.00	8.17	1.00

Note: $share\ of\ gains = \Delta PS_F (or\ \Delta PS_N)/\Delta PS_D$