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A Note on Policy-Mix for Environment and Production in the Presence of Tax Evasion*

Shigeru Watanabe**

ABSTRACT: A purpose of this note is to study a policy-mix for environment and production in the presence of tax evasion. A relationship between the environment and the production level, which in turn will affect the level of employment, is important. Following main results have been derived from the analysis of this note. In the case of tax evasion by overstating cost, raising both the penalty rate of profit tax evasion and profit tax rate will decrease the rate of cost overstatement for tax evasion and the amount of tax evasion with respect to profit tax with eliminating negative effects on waste level and production level. When only the penalty rate is raised without raising the tax rate, waste level is increased but production level is decreased, even if the rate of cost overstatement for tax evasion and the amount of tax evasion are decreased. On the other hand, in the case of tax evasion by understating proceeds, the same policy-mix will decrease the rate of proceeds understatement for the tax evasion and the amount of tax evasion with eliminating negative effect on the production level. When only the penalty rate is raised without raising the tax rate, the production level is decreased though the waste level is not affected in this case, even if the rate of proceeds understatement for tax evasion and the amount of tax evasion are decreased. Regardless of cases of the tax evasion with respect to profit tax, the amount of underreported waste and that of tax evasion with respect to pollution tax can also be decreased by the same policy-mix.

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Key Words: tax evasion, environment, production, employment, policy-mix

1. Introduction

The relationship between tax evasion* and environment has been examined in Watanabe (1996c, 2009, 2010). The behavior of the firm under imperfectly enforceable

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pollution tax has been analyzed by Harfold (1978).

A purpose of this note is to study a policy-mix for environment and production in the presence of tax evasion. Following main results have been derived from the analysis of this note.

In the case of tax evasion by overstating cost, raising both the penalty rate of profit tax evasion and profit tax rate will decrease the rate of cost overstatement for tax evasion and the amount of tax evasion with respect to profit tax without giving negative effects on waste level and production level, which in turn will affect the level of employment. When only the penalty rate raises without raising the tax rate, waste level will increase but production level will decrease, even if the rate of cost overstatement for tax evasion and the amount of tax evasion decrease.

On the other hand, in the case of tax evasion by understating proceeds, the same policy-mix will decrease the rate of proceeds understatement for the tax evasion and the amount of tax evasion with eliminating negative effect on the production level. When only the penalty rate raises without raising the tax rate, the production level decreases though the waste level is not affected in this case, even if the rate of proceeds understatement for tax evasion and the amount of tax evasion decrease.

Regardless of cases of the tax evasion with respect to profit tax, the amount of underreported waste and that of tax evasion with respect to pollution tax can also be decreased by the same policy-mix. In the next section simple analysis will be made using the notations and the results obtained in Watanabe (2009, 2010). In the last section concluding remarks will be given.

2. Environment and Production in the Presence of Tax Evasion

From Watanabe (2009, 2010), following results can straightforwardly be derived. Raising the penalty rate of profit tax evasion will decrease the production levels in both cases. It increases the waste level in the case of tax evasion by overstating cost though the waste level in the case of tax evasion by understating proceeds will not be affected. It decreases both the rate of proceeds understatement for tax evasion and that of cost overstatement.

Simple calculation straightforwardly yields the following condition under which raising both the profit tax rate and the penalty rate of profit tax evasion will have no negative
effects on the waste level and the production levels;

\[ \frac{F}{t} \frac{dt}{dF} = 1 - t, \]  

(1)

where \( t \) is the tax rate and \( F \) is the penalty rate of profit tax evasion.

Hence, for example, if the tax rate is 0.3, then raising the penalty rate of the profit tax evasion 1\% and raising the tax rate 0.7\% at the same time will decrease both the rate of proceeds understatement for tax evasion and that of cost overstatement without giving negative effects to both the waste level and the production level, which in turn will affect the level of employment. Similarly it is straightforwardly derived that the amount of profit tax evasion can also be decreased by the same policy-mix.

In the same way, from Watanabe (2009, 2010) the amount of underreported waste can be denoted by (2).

\[ \frac{1 - t}{2r_0(F_w - st)}, \]  

(2)

where \( F_w \) is the penalty rate of the detected underreported waste.

Differentiating (2) with respect to \( t \) or \( F \) yields the following relations;

\[ \partial \left[ \frac{1 - t}{2r_0(F_w - st)} \right] \bigg/ \partial t < 0, \]  

(3)

\[ \partial \left[ \frac{1 - t}{2r_0(F_w - st)} \right] \bigg/ \partial F = 0. \]  

(4)

Therefore, from (4) the amount of underreported waste does not depend on the penalty rate of the tax evasion with respect to profit tax. However, from (3) the amount of underreported waste can be decreased by raising the profit tax rate. Hence the same policy-mix which requires raising the profit tax rate can decrease the underreported waste. In the same way, the amount of tax evasion with respect to pollution tax can also be decreased by the same policy-mix regardless of the cases of tax evasion with respect to profit tax.

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3. Concluding Remarks

A purpose of this note is to study a policy−mix for environment and production in the presence of tax evasion. A relationship between the environment and the production level, which in turn will affect the level of employment, is important.

Following main results have been derived from the analysis of this note. In the case of tax evasion by overstating cost, raising both the penalty rate of profit tax evasion and profit tax rate will decrease the rate of cost overstatement for tax evasion and the amount of tax evasion with respect to profit tax with eliminating negative effects on waste level and production level. When only the penalty rate raises without raising the tax rate, waste level increases but production level decreases, even if the rate of cost overstatement for tax evasion and the amount of tax evasion decrease.

On the other hand, in the case of tax evasion by understating proceeds, the same policy−mix will decrease the rate of proceeds understatement for the tax evasion and the amount of tax evasion without giving negative effect on the production level. When only the penalty rate raises with eliminating raising the tax rate, the production level decreases though the waste level is not affected in this case, even if the rate of proceeds understatement for tax evasion and the amount of tax evasion decrease.

Regardless of cases of the tax evasion with respect to profit tax, the amount of underreported waste and that of tax evasion with respect to pollution tax can also be decreased by the same policy−mix.

NOTES

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