

REPORT ON MASTER THESIS
CENTER FOR ECONOMIC RESEARCH AND GRADUATE EDUCATION

STUDENT:	Davit Asatryan
ADVISOR:	Doc. Krešimir Žigić, Ph.D.
TITLE OF THE THESIS:	Digital Piracy: Subsidize Software Developers or Tax Them? The Interaction between Public and Private IPR Protection.

OVERALL ASSESSMENT (*provided in English, Czech, or Slovak*):

Please provide your assessment of each of the following categories, summary and suggested questions for the discussion. The minimum length of the report is 300 words.

CONTRIBUTION:

The author presents original ideas on the topic, demonstrating critical thinking and the ability to draw conclusions based on the knowledge of relevant theory. While a few problems should be addressed and clarified (see below), the thesis has a distinct value added. In particular, the thesis studies how a subsidy/tax on the producer's side, instead of on the consumers' side, affects welfare in a market with digital piracy. The degree of contribution depends on how those problems are addressed. Furthermore, the literature review should do a better job of explaining the marginal contribution of the thesis.

METHODS:

The thesis builds a game theoretical model to study digital piracy and relevant policy remedies. The tools used are appropriate and adequate to the author's level of study. One major weakness is that the author does not clearly define or derive equilibria of the model. I would expect to see an explicit characterization of equilibrium under certain conditions. Only after such characterization the comparative statics exercises would make sense.

On p. 36, at the end of paragraph 1, the author asserts that "if $C9$ is satisfied, the monopolist will choose to accommodate piracy, otherwise he will deter it." If this is true, then it should be stated as a characterization of equilibrium under a Proposition. That is, there is a unique (subgame-perfect) equilibrium depending on $C9$. If $C9$ is satisfied, the government chooses a subsidy in equilibrium to maximize social welfare, and such a subsidy induces the monopolist to accommodate piracy in equilibrium; if $C9$ is violated, the government chooses a tax in equilibrium to maximize social welfare, and such a tax induces the monopolist to deter piracy in equilibrium.

However, I have some concerns about the result. The major problem is that the author derives the necessary conditions for a certain equilibrium (piracy-accommodation equilibrium or piracy-deterrence equilibrium) but does not correctly verify the sufficiency. This may be fine for some games (but still unclear) when the derivations are careful, and all steps are "if-and-only-if," which may not be the case here. Let me use the following example to illustrate the problem. All derivations in Section 3.5, including π^* *accommodate* (17,27), are valid under the assumption

$C9$ and that the demand is defined by $D(p, \alpha)$. In particular, when $C9$ is violated, $p > \alpha f / \theta$ may not hold, and the demand is no longer $D(p, \alpha)$. Therefore, whenever using π^* *accommodate*, one should keep in mind that it is valid only under the condition $C9$. However, on p. 35-36, $\Delta\pi^*$ uses π^* *accommodate* (27) and is not valid when $C9$ is violated. Therefore, we cannot conclude anything based on this calculation when $C9$ is violated. (Note that this is saying the analysis is invalid but not saying the conclusion is incorrect. The conclusion may still be correct under more careful analysis.) Similar problems appear throughout the analysis. For instance, under what conditions the comparative statics analysis is valid (note that the comparative statics analysis should be based on equilibrium strategies of the whole game; otherwise, the author should clarify what it means by comparative statics analysis)?

LITERATURE:

The section demonstrates the author's understanding and command of the literature. The relevant literature is quoted properly. One weakness is that the review is too long and does not clearly explain the marginal contribution of the thesis. The point of every paragraph should be to help the reader understand the positioning of the thesis, not to talk about piracy in general.

MANUSCRIPT FORM:

The thesis is well-written and has a clear structure. My suggestion on the structure is to shorten the Literature review section and focus more on its marginal contributions, to split the Model section into two sections--one about the setting of the model (Model) and one about its analysis (Analysis and results), to combine the Discussion and Conclusion sections. One weakness is that major results should be structured under Lemmas/Propositions/Theorems and perhaps put mathematical proofs under Proofs. In this way, the results would be easier to read and assess.

SUMMARY AND SUGGESTED QUESTIONS FOR THE DISCUSSION DURING THE DEFENSE:

The thesis studies how subsidizing the piracy-detecting technology of a digital product affects the producer's decision on the technology implementation and explores the welfare consequences. The author considers a game between a government, a monopolistic producer, and a continuum of heterogeneous consumers. The government decides first how much to tax or subsidize the piracy-detecting technology to maximize social welfare (social welfare is defined unconventionally). The producer then decides the price of the digital products and how much to implement the piracy-detecting technology. Implementing the piracy-detecting technology is costly but increases the detecting probability of user-end piracy. Observing the price and the degree of the piracy-detecting technology, consumers with different private values decide whether to buy the original product, use the pirated product, or not use the product at all. The author finds that the degree of subsidies and the degree of piracy-detecting technology are strategic complements. Moreover, the author claims that both subsidies and taxes may appear in equilibrium, depending on the relationship between the exogenous piracy fine and the quality of the pirated product.

Besides those questions raised above, in particular the characterization of equilibrium, several other questions may be worth discussing:

1. Why cannot a government decide on how much fines to punish piracy? Eventually, it is the government-affiliated agencies to implement such fines. For user-end piracy, should users who upload digital products be distinguished from users who download them in terms of

punishment fines? Should only the former be punished? Is this what happens in some countries? What is the legal background?

2. Social welfare should count for consumers who use pirated products, as well as fines. Even though there may be empirical measurement problems, it is of theoretical interest. Piracy reduces innovation incentives. But if such an effect is not counted, as in this model, and if the product already exists, piracy is a way to reduce market power. It is unclear why the government would want to fight piracy (except it destroys innovation incentives, which is not counted in this model). Moreover, empirical measurement/estimation of users who use pirated products may be possible by using the data from the fines. Even if direct measurement is impossible, a theoretical model can provide some structural identification.
3. It is assumed that the quality of the pirated products is given. I wonder what would happen if the quality is increasing in the demand for the original products. Therefore, a popular product has a higher quality pirated copy, while an unpopular product has a lower quality pirated copy. This gives a reason for the government to fight piracy to increase the demand for the original products and the welfare of users who use pirated products (otherwise, the pirated copy has a low quality). In reality, a popular product is easier to download (perhaps illegally) from the internet, while a niche product is harder, which may motivate such an assumption.
4. Subsidizing the piracy-detecting technology may be infeasible if such technology is hard to verify (as it needs the firm to disclose such technology and requires an expert to verify it), while subsidizing the product itself may be easier. What is happening in reality? What are the theoretical implications if the government can only subsidize the product, not the technology?

Some minor comments:

1. In the abstract and elsewhere in the text: “I find that subsidies and piracy fines are strategic substitutes”. The piracy fines are assumed to be exogenous (which may be a debatable assumption; see above), not a player’s decision. What do strategic substitutes mean?
2. On p. 16, in the second paragraph, “The stochastic dominance has been observed for some of the stochastic models”. What does stochastic dominance mean here? Between which two random variables?
3. I find that there are many jargons that should be explained. For example, on p. 5, in the penultimate paragraph, what do the following mean: “a single model”, “theory of planned behavior and linked research”, and “behavioral control”?
4. What do “→” and “=>” mean in [C1- C8]? Are those necessary or sufficient conditions, or both?
5. I don’t understand the discussion in the last two paragraphs on p. 36: “Essentially, this means that the government cannot really induce the monopolist to choose any of the strategies.” Is it that the government chooses a subsidy or tax to optimally induce a certain strategy of the monopolist so that social welfare is maximized? I thought this was one of the main points of the thesis. Is it so?

Please indicate whether you recommend the Thesis for defense or not.

I recommend the thesis for defense.

TEXT ORIGINALITY CONTROL

I confirm that I acquainted myself with the report on the originality of the text of the thesis from

Theses Turnitin Ouriginal (Urkund)

Comments on the reported results:

SUMMARY OF POINTS AWARDED *(for details, please see the page 3)*

CATEGORY	POINTS
Contribution <i>(max. 30 points)</i>	25
Methods <i>(max. 30 points)</i>	20
Literature <i>(max. 20 points)</i>	16
Manuscript Form <i>(max. 20 points)</i>	16
TOTAL POINTS <i>(max. 100 points)</i>	77
GRADE <i>(A – B – C – D – E – F)</i>	C

NAME OF THE REFEREE:

Yiman Sun

DATE OF EVALUATION: 18/08/2023



REFEREE SIGNATURE

EXPLANATION OF CATEGORIES AND SCALE:

CONTRIBUTION:

The author presents original ideas on the topic demonstrating critical thinking and ability to draw conclusions based on the knowledge of relevant theory and empirics. There is a distinct value added of the thesis.

Strong	Average	Weak
30	15	0

METHODS:

The tools used are relevant to the research question being investigated, and adequate to the author's level of studies. The thesis topic is comprehensively analyzed.

Strong	Average	Weak
30	15	0

LITERATURE REVIEW:

The thesis demonstrates author's full understanding and command of recent literature. The author quotes relevant literature in a proper way.

Strong	Average	Weak
20	10	0

MANUSCRIPT FORM:

The thesis is well structured. The student uses appropriate language and style, including academic format for graphs and tables. The text effectively refers to graphs and tables and disposes with a complete bibliography.

Strong	Average	Weak
20	10	0

OVERALL GRADING:

TOTAL	GRADE
91 – 100	A
81 – 90	B
71 – 80	C
61 – 70	D
51 – 60	E
0 – 50	F