REPORT ON MASTER THESIS
CENTER FOR ECONOMIC RESEARCH AND GRADUATE EDUCATION

STUDENT:	**Konstantin Bakharev**
ADVISOR:	**Sergey Slobodyan**
TITLE OF THE THESIS:	**ICT corporation within the modern market economy: benefits and side effects of hosting "Silicon Valley"**

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 paper proposes to study the role of government policies in helping to establish or further advance the ICT sector in the country. It is indeed a very important and relevant economic issue, still practically uncovered in the literature, and thus deserving attention of researchers. It is also a quite difficult economic issue in its full complexity. Konstantin Bakharev provided a very good choice of relevant theoretical, empirical and policy-related literature on the topic. The title of the thesis and its research question "How a country can become more attractive for Google to establish there its new facility" stated in the Master Thesis Proposal seem to be too narrow and specific to be effectively answered by the use of theoretical and empirical methods proposed in the paper. So when I found that the answer to that question would not (and could not) be delivered in the thesis I took it easily. An answer to a much broader research question of analyzing the role of government policies in establishing or further advancing the ICT sector, its development and the use of its products in the economy can still be considered as very relevant and important research finding. The decision to devote attention both to the theoretical and empirical aspects of the studied phenomena is also proper.
- Unfortunately, the concrete execution of the theoretical part and very likely also the empirical part of the thesis (demonstrated below), which (i) does not reflect properly the proposed targets of the analysis or (ii) contains significant omittings and errors, or both, leads to the conclusion that the thesis results need to be mostly considered as irrelevant (where (i) above applies) and incorrect (where (ii) above applies).

METHODS:

- In the theoretical part of the thesis captured in Chapter 3 GE model of taxation on the ICT markets the Chen et al (2017) model is used. The only innovation of the model is a modification of the used production function: instead of the Cobb-Douglas production function Konstantin proposes the CES production function (allowing him to capture the aspect of a developed and developing economy by setting the value of the elasticity of

substitution among production inputs being below or above 1). Unfortunately, there are many misrepresentations and errors in this section:

- The author took the Chen model in continuous time and tried to transform it to a discrete time version but made several mistakes there:
  - Household's lifetime welfare is expressed in continuous time
  - An incorrect HH budget constraint
  - The Euler equation on p. 29 is incorrect
  - Wrong no arbitrage condition on p.29;
- The 4th equation on p.27 for the growth rate of innovation implies that along the BGP A_t and K_t grow at the same rate; the incorrect 3rd equation on p.30 contradicts it since it implies that the BGP growth rate of capital would be γ/σ. However, all the intensive variables should grow at the same rate along the BGP.
- The formula on p.31 for the determination of the overall labor supply L, which is a minor modification of the formula from the Chen paper, is incorrect. The reason is that the formula capturing the determination of the constant level of labor supply on the BGP cannot contain the time dependent term A_{t+1}. Based on this all the further results on p.32 and the numerical solutions in the section 3.2.2 cannot be considered correct.
- Neither the structure of the model is modified nor the model calibration of parameter values are changed despite the fact that the original Chen et al (2017) endogenous growth model with expanding varieties (as in Romer, 1990) is set to analyze the whole US aggregated economy with the three sectors: the final good sector, the capital goods sector and the whole R&D sector.
- The assumed government policy scenario in Chen et al (2017) is “tax shifting from labor income tax to capital income tax”. Although this policy experiment is completely unrelated to the thesis proposed analysis, to all its discussions and to the claimed results, the same setup is used for getting the results in the thesis. Moreover, the thesis presents these results wrongly as a simple effect of an increase in the tax rate on capital income (without mentioning the decrease in the labor ta income) and further sells this experiment unacceptably as a government policy to support the growth of the ICT sector.
  - The simulated results in Fig.2 on p.33 of the thesis has to be considered as incomplete and incorrect. Fig.2 corresponds to the results of Chen (2017) for the case when there is no capital in the innovation sector. The obtained numerical results in the thesis with the CES production function in the innovation sector should compare to the results on the effects of the existence of the physical capital input in the innovation sector with the CD production function - see Fig.11 in the Chen et al (2017) paper.
  - The formula for the aggregate labor supply L is incorrect (see the comment above), thus the effect of the change in the tax rate on capital income on L and the BGP growth rate and all the numerical simulations are incorrect as well.
- There are several false or incorrect statements related to this part of the thesis:
  - ”In the theoretical model studied above the main driver of economic growth is the population or labor growth." (p. 34)
  - "... shifting from the labor tax to income tax." (p. 30)

        - "For the growth to be optimal I have to assume that: last equation on p.30" – (p. 30).
- The empirical part of the thesis. I will refrain from commenting on the empirical part of the paper with two exceptions.
    - The main variables are not properly explained. On the top of p. 40 there is the main equation for statistical identification but the variable D_{ij} is not explained there. In the description of the second stage equation, which uses the variable D_{ij}, the term is described as "the ICT-suppoting (the author's typo) policy". Finally, in the text below we can find: "The main variable of interest is the cross-product of dummy for innovation supporting policies and change in the number of innovative firms."
    - Another significant mistake in the paper seems to be that the variable noted as GDP used extensively through out the paper actually contains data on GDP growth (!). This can be seen in Table 7 and Figure 4 in the Annexes on p.66.

LITERATURE:

As said before the thesis provides a very good choice of relevant theoretical, empirical and policy-related literature on the topic though some criticism applies here as well.

- The comprehensive discussion of the relevant literature is not only in the introduction of the thesis and in the special section on the relevant literature, where it is proper, but also appears in other additional parts of the thesis as in Chapter 4 Elasticity of substitution and economic growth, where it disturbs the attention from the obtained theoretical results.
    - The referred paper by Caroll and Young (2018) has nothing to do with an existence of an innovative sector as the ICT sector (they use the one-sector Romer (1986) model with externalities which is quite different from Romer (1990) used in this thesis)
    - "To sum up, the results of the model discussed in the previous section find support both in the theoretical and empirical literature." p.36. Another literature review, the uselessness of this section is expressed in the cited sentence.

MANUSCRIPT FORM:

It is OK though

- A very unfortunate innovation of the thesis is the fact that the equations are not numbered.
- There are too many not really focused and vague discussions in the thesis – see the comments below, e.g. "The main result of the paper (Chen, 2017) is that the capital tax may lead to an increase of the steady state growth rate of the economy." – p. 14.
- The last sentence of the abstract says: “I show that ICT support programs insignificantly increase the growth of developing countries and significantly decrease growth of developed economies.” I am sure that the author meant the statistical significance here. Omitting the word statistical gives that key sentence in the abstract quite a different meaning. (Leaving aside here that the claim seems to be inconsistent with the results presented in Table 4 on p. 45 - where the effects on GDP both for developed and developing countries are statistically significant – see the section on questions below).

- What could bother any reader is too many misspellings, some of them appearing almost systematically: e.g. “lamp-sum tax” or “counties”.

SUMMARY AND SUGGESTED QUESTIONS FOR THE DISCUSSION DURING THE DEFENSE:

- Lack of consistency in using the concepts of (i) the establishment of the ICT sector, (ii) innovation in this sector and (iii) the mere use of ICT goods and services in the production of other sectors of the economy and their interchangeable use. It blurs the whole discussion and prevents to reach any relevant implications from the analysis at a more detailed level.
- A missing adjustment of the Chen model to the paper setup and to the research question (the main numerical policy results of the model - i.e. tax shifting from labor income tax to capital income tax - are unrelated to the aim of the paper and are presented as if they are consistent with the government tax policies supporting the build up of the ICT sector). This comment together with the first comment above makes the whole analysis, at least at this stage, unreliable and invalid.
- The thesis is missing especially in its many discussion parts the focus on the relevant aspects of the study, mixing theoretical, empirical and sometimes even practical concepts which are used repetitively. There is vaguely mentioned e.g. regulation at some discussions without specifying its concrete content, its role and purpose in this study and no reflection in either the theoretical nor the empirical part.
    - “The effects of ICT on the global economy have not been unequivocally positive because the increase in transparency and international integration has created an environment conducive to manipulations of the financial markets.” (p. 1). It looks like that this unheard statement, unrelated to the topic, origins from the two referred papers there - Rasel (2016) and Basco (2014) - but none of these papers contain such a statement.
- Missinterpreted or misunderstood contributions of referred papers appear as if they are related to the targets of the thesis though they are not:
    - “Pieri et al (2018) build a theoretical model of the ICT sector which affects R&D" - p.8 of the thesis. In reality they setup a stochastic frontier production function model and try to assess the joint impact of R&D and ICT on productivity of output (in total and in high-tech and low-tech industries).
    - "Gruner (2009) shows how the same ICT firms have different effects in Europe and USA." – p. 8 of the thesis. In reality they show the effect of the introduction of new ICT technologies on efficiency within the non-ICT sectors.
    - “Brynjolfsson and McElheran (2016) study ICT sector effects from a different perspective focusing more on the manufacturing sector of the USA." - p.11. In reality they study the diffusion of DDD (data-driven decision-making) on manufacturing plants.
    - "Basco (2014) studies the theoretical model of the Dot-Com bubble crisis using several assumptions about both countries and the ICT sector itself which was the initial reason for recession." – p. 12. In reality there is no ICT sector in their model.
    - "While Cobb-Douglas may give more robust results and provide answers to a wider range of questions than the linear one, its plausibility for the description of

real-world relationship may be doubtful (Aiyar and Dalgaard, 2009)". They actually state: "A CD technology is not a bad approximation, for the development accounting, although it does overestimate the importance of factors of production relative to the residual."

- "Furthermore, Gilbert et al (2018) states that innovation requires a CES-like production function in the case of the oligopolistic market structure." -p.14. In reality Gilbert et al (2018) do not even discuss the CES production function. They instead document that - in the Aghion et al (1997), (2001), (2005) type of models - increasing the intensity of competition increases the innovation rate when the household has the CES utility function contrary to the case when the products are homogeneous.

- The striking statement: "This paper supports the idea that the effects of ICT-related policies may not be beneficial for the economic growth and development of the region." on p.54 cannot be accepted. One important comment needs to be placed here: the assessment of benefits of any government policy in modern macroeconomic theory (which is taught at CERGE) is not necessarily related to the growth effects but rather to the resulting welfare benefits.

Questions:

- My concrete critical comments on several important aspects of the thesis above create a good basis for suggesting potential questions during the defense.
- One more question related to the estimation results for the case when is the sample of the countries split into the group of developing and developed countries presented in Table 4. Question: the size of the obtained significant estimates (-18 and 23 for developed and developing countries, respectively) for the effect of policy x ICT employment – see table 4 on p. 45 of the thesis - seems to be excessive (especially when the specification of the estimated equation has variables in logs). Could you express numerically the resulting effects on GDP implied by these estimates and explain it – especially to the related comment to the Form of thesis above?

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 [X] Turnitin [ ] Ouriginal (Urkund)

Comments on the reported results:

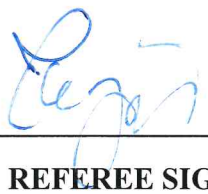
SUMMARY OF POINTS AWARDED *(for details, please see the page 3)*

CATEGORY		**POINTS**
Contribution	*(max. 30 points)*	15
Methods	*(max. 30 points)*	20
Literature	*(max. 20 points)*	20
Manuscript Form	*(max. 20 points)*	20
TOTAL POINTS *(max. 100 points)*		**75**
GRADE *(A – B – C – D – E – F)*		**C**

NAME OF THE REFEREE:

Michal Kejak

DATE OF EVALUATION: 31/8/2022



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**