RGC Ref. No.:
UGC/FDS14/B19/16
(please insert ref. above)

RESEARCH GRANTS COUNCIL
COMPETITIVE RESEARCH FUNDING SCHEMES FOR
THE LOCAL SELF-FINANCING DEGREE SECTOR

FACULTY DEVELOPMENT SCHEME (FDS)

Completion Report
(for completed projects only)

Submission Deadlines:	1. *Auditor's report with unspent balance, if any: within **six** months of the approved project completion date.*
	2. *Completion report: within **12** months of the approved project completion date.*

Part A: The Project and Investigator(s)

1.   Project Title

The Evolutionary Trend of International Income Inequality: An Analysis of Decomposition

and Transitional Dynamics

2.   Investigator(s) and Academic Department(s) / Unit(s) Involved

Research Team	Name / Post	Unit / Department / Institution
Principal Investigator	Cheong Tsun Se / Associate Professor	Department of Economics and Finance / The Hang Seng University of Hong Kong
Co-Investigator	Li Jing / Assistant Professor	Now: Department of Geography and Resource Management / The Chinese University of Hong Kong Previously: Department of Economics and Finance / The Hang Seng University of Hong Kong
Co-Investigator	Cheng Wui Wing / Associate Professor	Department of Economics and Finance / Hang Seng University of Hong Kong
Others		

3.   Project Duration

	Original	Revised	Date of RGC / Institution Approval (must be quoted)
Project Start Date	1 Jan 2017	NA	
Project Completion Date	31 Dec 2019	31 Dec 2020	25 Mar 2020
Duration (in month)	36	48	25 Mar 2020
Deadline for Submission of Completion Report	31 Dec 2020	31 Dec 2021	25 Mar 2020

Part B: The Final Report

5.   Project Objectives

5.1   Objectives as per original application

1. *To conduct inequality measurements for the world and reveal the recent evolutionary trend of income inequality;*
2. *To compute the contributions of different regional subgroups to overall inequality in an attempt to provide evidence on whether overall inequality can be mainly accounted for by the notorious North-South divide (that is, the difference in income between poor countries in the South and the rich countries in the North) or by the disparity within each of the different regional subgroups;*
3. *To determine the relative significance of the agricultural, industrial and service sectors to overall international inequality with the aim of understanding the contributions of the agricultural, industrial and service sectors to overall international inequality;*
4. *To examine the transitional dynamics of international inequality to forecast the future evolution of income inequality and provide detailed information on mobility within the world income distributions for different countries.*

5.2   Revised objectives

Date of approval from the RGC: _____

Reasons for the change: _____

_____

_____

1.

2.

3. ....

    5.3   Realisation of the objectives
(Maximum 1 page; please state how and to what extent the project objectives have been achieved; give reasons for under-achievements and outline attempts to overcome problems, if any)

All the project objectives listed above have been achieved fully.

Computer programs have been developed by the P-I for calculating different inequality measurements used in this project, namely, the Theil indexes and the Gini coefficient. By employing these programs, inequality measurements for the world were computed so that Project Objective 1 was completed fully.

The P-I also developed another software program for conducting decomposition by subgroups by using the Theil indexes. Therefore, Project Objective 2 was completed successfully. In addition, one journal article was completed based on the findings derived from Project Objectives 1 and 2.

Then the P-I developed the third computer program, which can carry out decomposition by income sources. By the employment of this computer program, Project Objective 3 was completed fully. The results show that the major driving factors behind inequality are industrialization and the development in the service sector. Another journal article was completed based on the findings derived from Project Objective 3.

The P-I then developed the computer program for conducting distribution dynamics analysis. The industrial sector and the service sector were selected for running the distribution dynamics analysis. Therefore, Project Objective 4 was completed fully. Two journal articles were completed based on the findings derived from Project Objective 4: one for industrialization and another for the development in the service sector.

    5.4   Summary of objectives addressed to date

Objectives *(as per 5.1/5.2 above)*	**Addressed** *(please tick)*	**Percentage Achieved** *(please estimate)*
1. To conduct inequality measurements for the world and reveal the recent evolutionary trend of income inequality.	√	100 %
2. To compute the contributions of different regional subgroups to overall inequality in an attempt to provide evidence on whether overall inequality can be mainly accounted for by the notorious North-South divide (that is, the difference in income between poor countries in the South and the rich	√	100 %

countries in the North) or by the disparity within each of the different regional subgroups.		
3. To determine the relative significance of the agricultural, industrial and service sectors to overall international inequality with the aim of understanding the contributions of the agricultural, industrial and service sectors to overall international inequality.	√	100 %
4. To examine the transitional dynamics of international inequality to forecast the future evolution of income inequality and provide detailed information on mobility within the world income distributions for different countries.	√	100 %

6. Research Outcome

6.1 Major findings and research outcome
(Maximum 1 page; please make reference to Part C where necessary)

There are four journal articles that have been derived directly from this project. The aim of the first journal article is to fill the gap in the literature by investigating global inequality with the decomposition technique. Decomposition by subgroups was conducted to evaluate the driving forces behind the evolution of inequality by using the Theil indexes. Almost all the countries in the world were included in this study, and the study period spans from 2000 to 2017. The analysis was carried out in several stages to evaluate the issue of the North-South divide, as well as the impacts of regional and income subgroups. There are several salient findings derived from this study. First, the results show that there was a gradual decline in international inequality within the study period. Second, there was still a large disparity between the developed and developing countries, and the inequality within the developing countries has aggravated further. Third, geographical location has exerted great impacts on global inequality, and East Asia contributed about 40% to the overall decline in international inequality. Fourth, the decline in inequality amongst the upper-middle-income countries also contributed substantially to the fall in international inequality.

The aim of the second journal article is to examine the evolution of inequality by focusing on the impacts of the economic structure. The technique of decomposition by income sources is employed to evaluate the contribution of the three major sectors, namely the agricultural, industrial, and service sectors to overall inequality by using the Gini coefficient. There are several findings: First, the service sector is identified as the largest contributor to global inequality, followed by the industrial sector, while the contribution of the agricultural sector is negligible. Second, for the North-South divide, the disparity in the service sector was more marked in the North than in the South. Third, the industrial sector played a major role in the South and contributed more than 40% to overall inequality. Finally, for the comparison across regions, although the contribution of the agricultural sector in most regions are below 1.5%; however, the contribution of the agricultural sector in both Sub-Saharan Africa and South Asia is more than 8%. Our analysis shows that the evolution pattern is very different for each region; therefore, it is necessary to take the effects of income and geographical location into consideration in formulating development policies.

The aim of the third journal article is to examine the distribution of global industrial output so as to unveil the disparity in industrial development and the feasibility of achieving convergence over time. Distribution dynamics analyses are conducted to investigate the evolution and pattern of

industrialization for all the countries in the world. Countries are then classified into different groups for analysing the geographical and income effects on industrial development. The results show that the disparity between the North and the South will enlarge further in the future. Moreover, it is found that the industrial development in the North will continue to prosper, while the industrial outputs in many countries in the South will drop below the global average.

The fourth journal article is to investigate the inequality in the development of the service sector. Distribution dynamics analyses are carried out for all the countries in the world. The data are then divided into different regional and income groups to evaluate the impacts of geographical location and income level on the development of the service sector. The results show that the service sector in many countries in the North will continue to grow, while the outputs of the service sector in many countries in the South will be below the global average. Moreover, it is shown that countries with higher per capita income will perform better in the development of their service sector than those with low per capita income, thereby highlighting the persistence of global inequality. Finally, this study shows that both the Sub-Saharan Africa region and the South Asia region are very important in the alleviation of global inequality.

6.2 Potential for further development of the research and the proposed course of action
(Maximum half a page)

This project shows that although overall international inequality has declined, some countries may become poorer in the future because they cannot achieve economic growth through industrialization and the development in the service sector. Therefore, it is crucial to analyze the driving factors of industrialization and the development in the service sector. One suggestion is to employ machine learning and other artificial-intelligence techniques to explore the determinants of growth. This can supplement current studies, which are mainly based on econometric models. The employment of other advanced machine learning techniques may offer new insights which are not available from the linear econometric models as many machine learning models are nonlinear. Therefore, the application of these new techniques may provide better forecasts which may prove valuable to policymakers in formulating development policies.

7. Layman's Summary
(Describe <u>in layman's language</u> the nature, significance and value of the research project, in no more than 200 words)

This research project is to examine the trends, composition and transitional dynamics of international income inequality. The investigation is conducted over four stages, centred on several related research directions. By combining the four components, this study can clearly reveal a comprehensive picture of the evolutionary trend of international income inequality.

The proposed project is divided into four research components. First, in the initial stage, different inequality measurement approaches and indicators are employed to provide an overview of the evolutionary patterns and trends of international inequality. Second, the countries are divided into regional subgroups, and a decomposition analysis by subgroup is conducted to estimate the contributions of the inter-regional components and each of the spatial groupings to overall international inequality. Third, the technique of decomposition by income sources is employed to evaluate the contributions of the three economic sectors. The information on the relative significance of the agricultural, industrial and service sectors can facilitate the formulation of industrial policy for economic development in developing countries. Finally, this study analyses the future evolution of regional inequality and assesses the possibility of convergence. The findings derived from the project may prove valuable to policymakers in formulating development policies for alleviating global inequality.

Part C: Research Output

8. Peer-Reviewed Journal Publication(s) Arising <u>Directly</u> From This Research Project

(Please attach a copy of the publication and/or the letter of acceptance if not yet submitted in the previous progress report(s). All listed publications must acknowledge RGC's funding support by quoting the specific grant reference.)

The Latest Status of Publications				Author(s) *(denote the corresponding author with an asterisk*)*	Title and Journal / Book *(with the volume, pages and other necessary publishing details specified)*	Submitted to RGC *(indicate the year ending of the relevant progress report)*	Attached to this Report *(Yes or No)*	Acknowledged the Support of RGC *(Yes or No)*	Accessible from the Institutional Repository *(Yes or No)*
Year of Publication	Year of Acceptance *(For paper accepted but not yet published)*	Under Review	Under Preparation *(optional)*						
	2021			Ning Ma, Tsun Se Cheong and Jing Li*	MA, N., CHEONG, T. S., & LI, J. 2021. Evaluating Global Inequality Using Decomposition Approach. *Frontiers in Psychology*, Forthcoming.		Yes (Annex I)	Yes	No
2021				Ning Ma, Victor Jing Li, Tsun Se Cheong and Delin Zhuang*	MA, N., LI, V. J., CHEONG, T. S., & ZHUANG, D. 2021. The Evolutionary Trend of Global Inequality: Analyzing the Impacts of Economic Structure. *Frontiers in Psychology*, Forthcoming.		Yes (Annex II)	Yes	Yes https://researchdb hsu.ed u hk/view/pu blication/202 100162
2021				Ning Ma, Wai Yan Shum*, Tingting Han and Tsun Se Cheong	MA, N., SHUM, W. Y., HAN, T., & CHEONG, T. S. 2021. Global Industrial Development: Insights from the Distributio		Yes (Annex III)	Yes	Yes https://researchdb hsu.ed u hk/view/pu blication/202 100161

				n Dynamics Approach for the Post Covid Era. *Frontiers in Public Health*, 9, 792947. doi: 10.3389/fpubh.2021.792947.				
2021				**Ning Ma, Wai Yan Shum*, Tingting Han and Tsun Se Cheong**	**MA, N., SHUM, W. Y., HAN, T., & CHEONG, T. S. 2021. Global Inequality in Service Sector Development: Trend and Convergence.** *Frontiers in Psychology*, 12: 792950. doi: 10.3389/fpsyg.2021.792950	**Yes (Annex IV)**	**Yes**	**Yes https://researchdb hsu.edu hk/view/publication/202100164**

9. **Recognized International Conference(s) In Which Paper(s) Related To This Research Project Was / Were Delivered**
   (Please attach a copy of each conference abstract)

Month / Year / Place	Title	Conference Name	Submitted to RGC *(indicate the year ending of the relevant progress report)*	Attached to this Report *(Yes or No)*	Acknowledged the Support of RGC *(Yes or No)*	Accessible from the Institutional Repository *(Yes or No)*
N/A						

10. Whether Research Experience And New Knowledge Has Been Transferred / Has Contributed To Teaching And Learning
(Please elaborate)

N/A

11. Student(s) Trained
(Please attach a copy of the title page of the thesis)

Name	Degree Registered for	Date of Registration	Date of Thesis Submission / Graduation
N/A			

12. Other Impact
(e.g. award of patents or prizes, collaboration with other research institutions, technology transfer, teaching enhancement, etc.)

N/A

13. Statistics on Research Outputs

	Peer-reviewed Journal Publications	Conference Papers	Scholarly Books, Monographs and Chapters	Patents Awarded	Other Research Outputs (please specify)	
					Type	No.
No. of outputs arising directly from this research project	3 published 1 accepted					

14. Public Access Of Completion Report
(Please specify the information, if any, that cannot be provided for public access and give the reasons.)

Information that Cannot Be Provided for Public Access	Reasons
N/A	