RESEARCH GRANTS COUNCIL
**Application for Allocation from
the General Research Fund for 2019/20
Application Form (GRF1)**

- **Please read the Explanatory Notes GRF2 (Aug 18) carefully before completing this form.**

- **To safeguard the interests of the researcher and the university, the awardee university bears the primary responsibility for prevention, detection and investigation of research misconduct, including but not limited to misuse of funds, data falsification, plagiarism and double-dipping. The university is strongly encouraged to vet the grant applications using anti-plagiarism software before submitting them to the RGC.**

PART I   SUMMARY OF THE RESEARCH PROPOSAL
[To be completed by the applicant(s)]

1. Particulars of the Project

(a) (i) Name and Academic Affiliation of Principal Investigator (PI):

Name	Post	Unit/ Department/ University
Prof Holz, Carsten A.	Professor	Division of Social Science/The Hong Kong University of Science and Technology

(ii) Is the PI a new appointee within 2 years of full-time paid appointment to his/her first substantive position as an academic staff in a university at the time of submission of the proposal?

Yes ☐   No ☑

(iii) Title of Project: Physical Capital Measures for China (1952 – 2017)

(iv) Nature of Application

New ☐   Re-submission ☑   Continuation ☐

(b) (i)   Primary Field: Area Studies (including Japanese Studies, China Studies, European Studies) **& Code** 4421

Secondary Field: Economics **& Code** 5102

(ii) A maximum of five keywords to characterise the work of your proposal
(a maximum of 30 characters for each keyword)
1) Capital theory
2) Capital service measurement
3) Physical capital stock
4) Wealth capital
5) Productivity studies

(iii) Project Duration: <u>36</u> Months*

> * for longer term projects, please explain in your research plan in Part II 2(b)(i) why
> the proposed research cannot be completed within the normal span of 36 months.

(iv) Total Amount Requested: $ 487,200

(c) Abstract of Research comprehensible to a non-specialist (either a maximum of 400 words in one <u>A4</u> page of PDF document in standard RGC format or a maximum of 400 words for direct input in the text box):

Physical capital estimates are widely used in economic growth and productivity studies and for profitability measurement and wealth accounting exercises. Yet the calculation of "capital" frequently receives only cursory attention, despite the challenges posed by conceptual difficulties, the complexity of calculations, and the extensive data requirements.

This project will focus on the calculation of the capital service values used in economic growth and productivity studies for the case of China; it will also provide the wealth capital values necessary for profitability measurement and wealth accounting exercises. The calculation of capital service values follows a complex procedure pioneered by Jorgenson (1963) and Jorgenson and Griliches (1967), which was more recently summarized and formalized by the Organization of Economic Cooperation and Development (OECD, 2009). Presumably due to their complexity, such calculations are typically only undertaken by country statistics offices, such as the U.S. Bureau of Labor Statistics (BLS) and the Australian Bureau of Statistics (ABS).

This project will calculate China's physical capital values using the complex procedures outlined by the OECD (2009) and followed by the BLS and ABS. It will also provide a critical discussion of some of the shortcuts advocated by Jorgenson and the OECD. The key output of the project is a long-run annual national capital series (capital services, wealth capital) for China from 1952 to 2017, based on detailed sector (industry) data. The data series resulting from the proposed project are intended as a cornerstone for future growth and productivity studies, allowing definite conclusions on issues such as technological progress and structural change across economic sectors.

RGC Ref No. 16601519

(d) Special funding template (Applicants can select more than one box)

☐ **Clinical Research Fellowship Scheme (Please also complete an additional form (Enclosure I) and see Enclosure II) (only available for applications under Biology and Medicine Panel)**

☐ **Support for Individual Research (Time-off) (see Enclosure III) (only available for applications under Humanities and Social Sciences Panel and Business Studies Panel)**

☐ **Longer-term Research Grant (see Enclosure IV)**

☐ **Employment of Relief Teacher under Humanities and Social Sciences Panel (see Enclosure V) (only available for applications under Humanities and Social Sciences Panel)**

☐ **Provision of Research Experience for Undergraduate Student (see Enclosure VI)**

☑ **Support for Academic Research related to Public Policy Developments (see Enclosure VII)**

PART II   DETAILS OF THE RESEARCH PROPOSAL

[To be completed by the applicant(s)]

RESEARCH DETAILS

1.   **Impact and objectives**

   (a maximum of 800 words in total for the long-term impact and project objectives)

(a) Long-term impact:

The literature largely agrees on the need for capital service values rather than wealth capital stock values in economic growth and productivity studies. Yet the complexity of capital service calculations leads to the use of a simple wealth capital stock concept -- capital stock is depreciated last year's capital stock plus this period's investment -- across the vast majority of growth and productivity studies.

Proponents of the capital service approach themselves (such as Jorgenson, 1995) have adopted conceptual shortcuts in order to reduce complexity (for example, substitution of a geometric age-efficiency profile for a hyperbolic age efficiency profile). The conceptual shortcuts allow simplification of capital service calculations to the point where the original conceptual framework is lost and capital service values are little more than values of convenience. In the proposed work, I will implement the complete, complex calculations of capital service values as presented by the Organization for Economic Cooperation and Development (OECD, 2009), and as implemented by country statistics offices such as the BLS and ABS,

No such series exist for China. There are many studies of China's capital stock, yet none makes use of the extensive Chinese investment data available and none appears to use the conceptually correct method. Nor do they proceed into the sector (industry) details that this study pursues. The data series resulting from the proposed project are intended as a cornerstone for future growth and productivity studies, allowing definite conclusions on issues such as technological progress and structural change across economic sectors.

(b) Objectives

[Please list the objectives in point form]

1.   Calculate the annual capital service and wealth capital values for China from 1952 to 2017, to the greatest extent possible using a breakdown by economic sectors (industries)

2. Background of research, research plan and methodology:
(a maximum of seven <u>A4</u> pages in total in standard RGC format for items (a) and (b)(i); a maximum of one <u>A4</u> page for item (b)(ii))
(a) Background of research
(b) (i) Research plan and methodology

Attached 3 pages(s) as follows

(b) (ii) A one-page Gantt Chart showing the research activities

Attached 1 pages(s) as follows

(c) A maximum of two non-text pages of attached diagrams, photos, charts and table etc, if any.
(d) Reference (a maximum of three pages for references is allowed for listing the publications cited in Section 1-2. All full references should be provided, including all authors of each reference.)

Australian Bureau of Statistics. Australian System of National Accounts：Concepts, Sources and Methods. 2014. At http：//www.abs.gov.au/AUSSTATS/abs@.nsf/MF/5216.0.

Bureau of Labor Statistics. Overview of Capital Inputs for the BLS Multifactor Productivity Measures. July 26, 2006, 12pp. At www.bls.gov/mfp/mprcaptl.pdf.

CAI Xiaochen. "China's Capital Inputs, 1978-2007" (Zhongguo ziben touru：1978-2007). Guanli shijie, no. 11 (2009)：11-20.

CAO Yuequn, Qin Zengqiang, Qi Qian. "Estimates of China's Capital Services" (Zhongguo ziben fuwu gusuan). Tongji yanjiu 29, no. 12 (2012)：45-52.

Chow, Gregory C. (1993). "Capital Formation and Economic Growth in China." The Quarterly Journal of Economics 108, no. 3 (1993)：809-842.

Harper, Michael J. "The Measurement of Productive Capital Stock, Capital Wealth, and Capital Services." U.S. Department of Labor, Bureau of Labor Statistics. BLS Working Papers, Working Paper 128, June 1982.

Holz, Carsten A. "New Capital Estimates for China." China Economic Review 17, no. 2 (2006)：142-85.

Holz, Carsten A., and SUN Yue. "Physical Capital Estimates for China's Provinces, 1952-2015 and Beyond." 2017. In press, China Economic Review, available at http：//www.sciencedirect.com/science/article/pii/S1043951X17300913.

Hulten, Charles R., and Frank C. Wykoff. "The Measurement of Economic Depreciation." in Charles R. Hulten, ed., Depreciation, Inflation, and the Taxation of Income from Capital, URI Series, Urban Institute Press, Washington, D.C., 1981, pp. 82–125.

Hulten, Charles R., and Frank C. Wykoff. "Issues in the Measurement of Economic Depreciation Introductory Remarks." Economic Inquiry 34, no. 1 (January 1996): 10–23.

Investment 1950–2000. Zhongguo guding zichan touzi tongji shudian 1950–2000 (China Investment in Fixed Asset Statistics 1950–2000). Beijing: Zhongguo tongji chubanshe, 2002.

Investment Yearbook. Zhongguo guding zichan touzi tongji nianjian (China Investment in Fixed Assets Statistical Yearbook). Beijing: Zhongguo tongji chubanshe (Zhongguo jihua chubanshe since the 2004 issue), various issues. (The following issues, with the year in the title, have so far been published: 1950–95, 1997, 1998, 1999, and then annually 2003– [but not 2014].)

Jorgenson, Dale W. "Capital Theory and Investment Behavior." The American Economic Review 53, no. 2 (May 1963): 247–259.

Jorgenson, Dale W., and Zvi Griliches. "The Explanation of Productivity Change." Review of Economic Studies 34, no. 3 (July 1967): 249–83.

Jorgenson, Dale W. "Productivity and Economic Growth," Chapter I, Volume II, in Dale W. Jorgenson (ed.), Productivity, Volumes I and II, Cambridge: MIT Press, 1995, pp. 1–98.

NBS website. http://www.stats.gov.cn (data section)

OECD. OECD Manual: Measuring Capital. Paris: OECD, 2001, and second edition 2009.

SUN Linlin, and REN Ruo'en. "Estimates of China's Capital Input and Total Factor Productivity" (Zhongguo ziben touru he quan yaosu shengchanlv de gusuan). Shijie jingji, no. 12 (2005): 3–13.

SUN Linlin, and REN Ruo'en. "China's Sector Capital Accumulation during the Transition Period—Calculation of Capital Stocks and Flows" (Zhuangui shiqi woguo hangye cengmian ziben jilei de yanjiu—ziben cunliang he ziben liuliang de cesuan). Jingjixue (jikan) 13, no. 3 (2014): 837–62.

ZHANG Jun, WU Guiying, and ZHANG Jipeng. "Estimation of China's Provincial Capital Stock 1952–2000" (Zhongguo shengji wuzhi ziben cunliang gusuan 1952–2000). Jingji yanjiu, no. 10 (2004): 35–44.

(e) Output dissemination plan

Name of journal, conference or other dissemination means	Target timing of dissemination
I plan to submit the resulting paper to a high-ranked economics journal.	2022 – 3Q

a. Background of Research

I have been researching Chinese physical capital values for over ten years. My first foray into the topic was in the mid-2000s (Holz, 2006), when I used a one-hoss shay model to—in my view—significantly improve on the then existing literature (as of October 2018, that paper has 144 Google citations).

Between 2013 and 2017, I collaborated with the China Center for Human Capital and Labor Market Research on the construction of *provincial* capital measures to complement their human capital measures (Holz and Sun, 2017). I created a highly complex Excel spreadsheet to calculate capital services, while graduate students (notably SUN Yue) under my leadership compiled the raw data that went into each province's spreadsheet. I wrote the paper. The work involved in compiling the raw data, including the necessary double-checks, was too much for one person.

In the proposed project, I will replicate that analysis at the national level. At the provincial level, capital values are ultimately based on three quasi-sector series. However, at the national level, depending on the year, there are approximately 50-100 economic sectors (industries) which means that the data manipulations will exceed what can be done with Excel and I will need to use Matlab (programming). Thus, although the type of calculations is the same as that used previously (and the published paper shows my knowledge of the calculation procedures), the implementation will require a different approach.

In addition, in this project I will delve further into capital theory to engage with earlier authors and their arguments. In particular, I am critical of the shortcuts used in the literature, such as the geometric age-efficiency profile, and I want to examine their impact on the resulting capital service series. (The joint paper with SUN Yue presents the capital service concept and explains the calculations but does not discuss conceptual issues.) However, a (re)review of the literature, a significant part of which I read earlier, may lead to further insights that could convince me that such a discussion can be kept short.

In sum, my previous work should attest to my familiarity with the topic. The proposed project has the following new elements: national-level rather than provincial-level data; a much greater variety of raw data (breakdown by economic sectors (industries); a new technical approach to deriving the results (programming); and a deeper engagement with the theoretical literature.

Two bodies of literature are relevant: the China capital literature and the capital theory literature. I assume that the reviewers are familiar with capital theory and therefore with the differences between capital services and wealth capital stock, the relationship between the age-price and age-efficiency profiles, and the endogeneity issue (of the rate of return) in the derivation of capital services. The paper by Holz and Sun (2017) reviews some of this literature and explains the intricacies of the China data that will equally

affect the proposed project's calculation of national capital services.

Capital stock calculations are common in the literature on China (for example, Zhang, 1991; Chow, 1993), but studies focusing on capital services are rarer. The literature calculating some measure of national capital services includes Sun and Ren (2005) with a capital services index for 1980–2002, Cai (2009) with a capital services index for 1978–2007, and Cao et al. (2012) with a capital services index for 1978-2010. Sun and Ren (2014) provide national and 33 (exhaustive) sector capital services indices for 1981-2005, and Wu (2015) calculates a national capital services index with an exhaustive breakdown into 37 sectors for 1980-2010. The raw data, the methods, and the assumptions used in this body of literature vary greatly. Only Cai (2009) and Cao et al. (2012) consider the equivalency relationship between the age-efficiency profile and age-price profile and derive the age-price profile from a hyperbolic age-efficiency profile; these two Chinese-language articles do not provide enough information to determine whether the complexity of the capital services concept has been done full justice (furthermore, they cover a short period that is well past by now, and they do not provide a breakdown by economic sectors).

The proposed project will make the following contributions to the literature: (i) extensive data coverage (which explains my one financing request, for a postgraduate research student to help with the data work) and (ii) the avoidance of all shortcuts. The proposed project will calculate national capital series for capital services and wealth capital from 1952 to 2017 and will cover, depending on the year, approximately 50-100 sectors. All of the data will be made available online (in contrast to the typically "proprietary" approach in the literature).

The body of capital theory literature is large, starting with Jorgenson (1963) and Jorgenson and Griliches (1967), and there seems little point in reviewing it all as I am not questioning the concept of capital services. I will closely follow the OECD (2009) procedures—the OECD's summary recommendations on the consistent calculation of capital services across countries are the culmination of the capital theory literature—along with the practices of the BLS (2006) and ABS (2015), the two country-level statistical agencies that have engaged deeply with capital service calculations.

One issue in the capital theory literature that I will examine further is the widespread simplifying assumption of a geometric age-efficiency profile, which tremendously simplifies the calculation of capital services. Not only is it utterly unrealistic, it appears to me to require the quiet abandonment of key tenets of modern capital theory. This is also a repeated topic in the literature (Hulten and Wykoff (1981), Harper (1982), and was the subject of an entire issue of Economic Inquiry in 1996, led by Hulten and Wykoff (1996). Based on my reading of the literature for my provincial capital services paper, I believe that I have something further to say on the topic, although this will require another round of re-reading and re-thinking. This is both a review (and perhaps extension) of theory as well as an examination of the implications for capital

estimates when the theory (shortcut vs. complete method) is applied to the data.

b. Research Plan and Methodology

I will follow the OECD (2009) methodology, but without relying on their proposed shortcut via the geometric age-efficiency profile. (Application of the shortcut method will provide an alternative set of results that is of interest in itself, as a double-check of the implications of using the shortcut method.) Instead, I will follow the BLS (2006) and ABS (2015) approach to implement the complete methodology, including using a hyperbolic age-efficiency profile and deriving the age-price profile from the age efficiency profile.

I have described these procedures, including the idiosyncrasies of dealing with Chinese data, in Holz and Sun (2017), and I will not repeat that lengthy discussion here. One crucial point is that the sectoral breakdown of gross fixed capital formation (or gross capital formation) is based on the available fixed asset investment data (Investment 1950-2000, Investment Yearbook (annual issues), NBS website), with special consideration for the complexities of these data. Due to the amount of data and the changes in variable definitions over time, I am requesting funding for a postgraduate research student to help with data inputting and data manipulation.

-- If the reviewer is not familiar with standard capital theory, I am afraid that it cannot be compressed comprehensibly into a few pages (and I provide no innovation beyond known, accepted economic wisdom). The China data case is another matter, where some awareness of Chinese statistics would be useful, although the data quickly become overwhelming in their detail. I have spelled out both matters, carefully (and hopefully in a way that facilitates comprehension), in the published Holz and Sun (2017) article, which has gone through many iterations of fine-tuning, in many more pages than the RGC allows for this proposal.
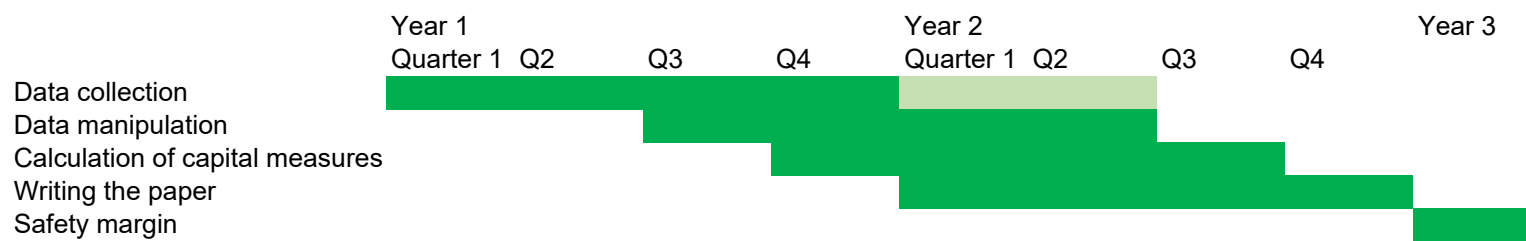
Please see
https://www.sciencedirect.com/science/article/pii/S1043951X17300913,
or
https://www.researchgate.net/publication/319149786_Physical_capital_estimates_for_China%27s_provinces_1952-2015_and_beyond

Carsten A. Holz
"Physical Capital Measures for China (1952-2017)"

	Year 1				Year 2				Year 3
	Quarter 1	Q2	Q3	Q4	Quarter 1	Q2	Q3	Q4	
Data collection									
Data manipulation									
Calculation of capital measures									
Writing the paper									
Safety margin									

3. Re-submission of a proposal not supported previously

(a)   Is this proposal a re-submission or largely similar to a proposal that has been submitted to but not supported by the UGC/RGC or other funding agencies?

Yes ☑   No ☐

If yes, please state the funding agency(ies) and the funding programme(s):

Hong Kong Research Grants Council, General Research Fund for 2018/19

Reference No(s). [for UGC/RGC projects only]: 16600718

Project title(s) [if different from Section 1(a) of Part I above]:

Previously: Physical Capital Measures for China (1952 – today)
Now: Physical Capital Measures for China (1952 – 2017)

Date(month/year) of application: 11/2017

Outcome: not supported

(b)   If this application is the same as or similar to the one(s) submitted but not supported previously, what were the main concerns / suggestions of the reviewers then?

I do not perceive any "main" concerns in the reviewer comments, nor do I see any make-or-break comment in any of the 5 reviewer reports. In the next section, I explain how I have handled all of the reviewers' comments.

(c)   Please give a brief response to the points mentioned in Section 3(b) above, highlighting the major changes that have been incorporated in this application.

My responses to questions / critical comments by the reviewers. (I am not repeating and responding to comments such as "The research design is excellent." – Thank you!)

Reviewer 1:
* Can this be done within the time frame (24 months) and with one RA? -- Yes, based on my experience with 30 provinces. This work is economy-wide (only 1 geographic entity) but with 50-100 economic sectors; the investment data are by sector, but other variables, such as deflators, are by necessity economy-wide (for example, by the three types of investment, i.e., just 3 series). I am happy to budget for 3 years and to ask for an RA for two years.

Reviewer 2：

* the concept of capital as a store of value seems unclear during the planned economy period － Questions about using the wealth concept for the planned economy is a criticism of the literature because the way much of the literature calculates capital stock means that it is using the wealth concept. The primary purpose of capital services calculated in this project is to obtain a measure of the productive services rendered by the capital stock during a given period：It has nothing to do with 'value,' and it ultimately serves to explain, for example, economic growth and technological change. Additionally, I provide wealth capital measures for all years since that is the standard measure used in the literature (for growth and technological change studies)；wealth capital measures also allows calculation of such values as profitability (which may have a rather particular meaning during the planned period).

* immediately after the entry to the WTO in 2001, foreign capital played a large role for providing productive services. I wonder if this is dealt with differently. － Distinguishing by ownership is an option that I am currently not pursuing. I agree that there was a period when foreign investment reached a peak of around ten percent of investment in the PRC, but it is now back down to about 2 percent. A distinction by ownership would only be possible for approximately the most recent 20 years and would seem to complicate things too much. I will keep an ownership distinction in mind, in case it turns out to be feasible to make that distinction.

* Weaknesses：Sometimes in the profession, there is a tendency to chase the hot area of research. This area [project] is important but probably not in the hottest areas. It contributes but may not be viewed as making major creative contributions. － This is basic work that has never been properly done. What can be done with the result of this work, namely calculate productivity measures and explain economic growth, may well qualify as 'hot.' I will be happy if other people use the capital series that result from this project (and cite my work).

* Suggested improvements：May be apply the OECD 2009 methods. That is one way to provide a comparison and benchmark. If the author can go beyond even the BLS 2006 method, provide a method that is not in existence, that would be a major improvement. － Yes, I will also apply the OECD's shortcut method, as a contrast. As to the BLS, I am not sure if a method that has been perfected by a group of career specialists on U.S. capital measures together with academics who spent their careers on capital theory can be improved upon, but if it turns out that it can, once I am deeply into this project, I will pursue it.

Reviewer 3：

* Not asking for enough money. － I have extended my request for research assistance from one to two years, to be on the safe side.

And: I will deal with some of the datawork myself rather than hand it all off to a student because there is much to be learned by looking at the data, how it is organized, how the organization changes over time, and what is happening to the actual values by the type of investment by sector.

* Think about how to extend to the pre-1949 year. – It is difficult to measure GDP and its component Gross Fixed Capital Formation (a key variable in the construction of capital measures) for a wartime economy (at a time when the concept of GDP has not even yet been invented), and it is uncertain how meaningful such GDP would be. I wonder whether the series constructed here can be linked up with the available estimates for the Republican period. This is something to explore.

Reviewer 4:

* The proposal needs to be more fully elaborated. ([And:] The design and methodology of the proposed research are appropriate. The calculation procedures of the proposed work will follow those by OECD.) – I have about 3 more pages of space in this GRF application that I could try to fit 10 pages of technique into (technique, that I did not invent and that macroeconomists are likely aware of) plus 5 pages of China data particularities. May I point the reviewer to published work of mine that provides detailed information on both? https://www.sciencedirect.com/science/article/pii/S1043951X17300913 or https://www.researchgate.net/publication/319149786_Physical_capital_estimates_for_China%27s_provinces_1952-2015_and_beyond

* The utility of the proposed work as mentioned above should be clearly stated. – I now emphasize that capital service measures are crucial to our understanding of the growth and productivity trajectory of the PRC, and that the establishment of definite capital series is the crux to resolving discussions about technological progress in the PRC, productivity, and growth issues.

Reviewer 5:

* Applications? Comparisons with other measures? – Yes and yes. (i) Capital services are the cornerstone of any statement about technological progress in China, productivity change, economic growth, or structural change. The literature tends to disagree quite a bit about technological progress in the PRC and I think that by providing a definite capital service series (which I intend to be the most careful work that can be done for the case of the PRC, given the data availability) the scope for diverging findings on these issues narrows dramatically. In addition, as another reviewer pointed out, (wealth) capital stock is the key measure for any argument regarding a declining rate of return (the Piketty literature), and to the extent that I intend the results of this project to be the definite capital series, any discussion of the trajectory of the rate of return in the PRC will benefit. (ii) I will compare the resulting capital values to those in the literature, and point out the implications for at least technological progress measures.

-- Having been given the opportunity to reread and change my application after 12 months, apart from addressing the reviewers' comments I have made numerous small changes in the hope to convince the reviewers even more fully that this is a worthwhile project.

PROJECT FUNDING

4. Cost and justification

(a)   Estimated cost and resource implications:
   [Detailed justifications should be given in order to support the request for each item below]
   (a maximum of 500 words for each box)

	Year 1 ($)	Year 2 ($)	Year 3 ($)	Year 4 ($)	Year 5 ($)	Total ($)

(A) One-line Vote Items

(i) Supporting Staff Costs

   [please read Section 4(a)(A)(i) of the Explanatory Notes GRF2 carefully]

Types

Monthly salary x Nos. x Months

Research Postgraduate Students

						$427,200

17,800 * 1 * 12   213,600

17,800 * 1 * 12   213,600

Justification:

A postgraduate student will be needed to help with data collection, data inputting, and data manipulation. I will be dealing with 65 years' worth of Chinese sector investment data, with varying sector details over the years (approx. 50–100 sectors) that have to be reconciled.

(ii) Equipment Expenses
[please itemize and provide quotations for each item costing over $200,000]

Justification:

Nil

Quotation Provided: Yes ☐ No ☑

(iii) Outsourcing Expenses of Research Work Outside Hong Kong
[please itemize your cost estimation with justification and provide quotations for work costing over $200,000; and provide detailed justification of sample sizes and costs for surveys conducted outside Hong Kong.]

Justification:

Nil

Quotation Provided: Yes ☐ No ☑

(iv) General Expenses
[please itemize and provide quotations for services/purchase costing over $200,000; and provide detailed justification of sample sizes and costs for surveys conducted in Hong Kong.]

Justification:

Nil

Quotation Provided: Yes ☐ No ☑

(v) Conference Expenses

Conference presentations	20,000	20,000	20,000	0	0	60,000

Justification:

To present my work at conferences to obtain feedback, and to make the availability of the data series better known to the research community. -- I am always perplexed by how poorly many economists understand the basic concepts of capital theory, despite it being central to growth theory. Presenting at conferences invariably raises interest, in particular when one sees the differences in outcomes once capital services are properly

derived (with major implications for how we view an observed economic growth performance).

Sub-total for (A) (One-line Vote Items): $ 487,200

(B) Earmarked Items

(vi) Costs for Employment of Relief Teacher
[see Enclosure III for individual research and Enclosure V for relief support under **Humanities and Social Scienecs Panel]**

Rank

Per course rate of relief teacher: x No. of course to be relieved

Justification:

Current Average Teaching Load: Total 0 courses per academic year [please report UGC-funded programmes only]

Nil

(vii) Expenses of Research Experience for Undergraduate Student
(see Enclosure VI for Provision of Research Experience for Undergraduate Students)

Justification:

Nil

(viii) High-performance Computing Services Expenses

Justification:

Nil

Quotation Provided: Yes ☐   No ☑

(ix) Research-related Software Licence /Dataset
[Please itemize and provide quotations for each item]

Justification:

Nil

Sub-total for (B) (Earmarked Items):	$	0
(x) Total cost of the proposal (A) + (B)	$	487,200

(C) Deduction Items

Less :

(xi) University's funding for provision of research experience for undergraduate student	$	0
(xii) Other research funds secured from other sources	$	0
Sub-total for C (Deduction Items):	$	0
(xiii) Amount requested in this application : (A) + (B) - (C)	$	487,200

(D) Academic Research related to Public Policy Developments

(xiv) Percentage of the total cost of the proposal related to public policy developments ((A) + (B))
[see Enclosure VII for Support for Academic Research relating to Public Policy Developments]   30%

(b)   Declaration on the Equipment Procurement:

☑   **(i) No procurement of equipment is required**

OR

☐   **(ii) I declare that the equipment indicated in 4(a)(A)(ii) above is not available in the university**

OR

☐   **(iii) I declare that all or some of the equipment (please provide details in the following text box) indicated in Section 4(a)(A)(ii) above is available in the university but cannot be used by me in view of the following reasons (a maximum of 500 words)**

Reasons : (a maximum of 500 words)

(c)   **Declaration on employment of relief teacher:**

☑   **(i) No relief teacher is required**

OR

☐   **(ii) I declare that I currently do not hold any grant for employment of relief teacher of any on-going project under UGC/RGC funding schemes**

OR

☐   **(iii) I declare that I hold grant for employment of relief teacher of the following on-going project(s) under UGC/RGC funding schemes (excluding Humanities and Social Sciences Prestigious Fellowship Scheme (HSSPFS)) and undertake to submit the corresponding completion report(s) by 15 April 2019**

(d)   **Declaration on high-performance computing services:**

☑   **(i) No procurement of high-performance computing services is required**

OR

☐   **(ii) I declare that the high-performance computing services indicated in Section 4(a)(B)(viii) above is not available in the university**

OR

☐   **(iii) I declare that all or some of the high-performance computing services (please provide details in the following text box) indicated in Section 4(a)(B)(viii) above is available in the university but**

cannot be used by me in view of the following reasons(a maximum of 500 words)

Reasons : (a maximum of 500 words)

(e)   **Declaration on the research-related software licence / dataset:**

☑   **(i) No procurement of research-related software licence / dataset is required**

OR

☐   **(ii) I declare that the research-related software licence / dataset indicated in Section 4(a)(B)(ix) above is not available in the university**

OR

☐   **(iii) I declare that all or some of the research-related software licence / dataset (please provide details in the following text box) indicated in Section 4(a)(B)(ix) above is available in the university but cannot be used by me in view of the following reasons (a maximum of 500 words)**

Reasons : (a maximum of 500 words)

5. **Existing facilities and major equipment available for this research proposal:**
   (a maximum of 400 words)

Nil

6. Funds secured or to be secured

(a) Other research funds already secured for this research proposal:
[This amount will be deducted from the total cost of the project in Section 4 of Part II above.]

Source	Amount ($)

(b) Other research funds to be or are being sought for this research proposal.
[If funds under this item are secured, the amount of the GRF to be awarded may be reduced]:

Source	Amount ($)

7. Particulars of PI and Co-Is

(a) Investigator(s) information:
Name and Academic Affiliation of Applicant:

	Name	Post	Unit/ Department/ University	ORCID iD	Current Member of UGC / RGC / / Panel / Committee as at application deadline (Yes or No)	Name of UGC / RGC / Panel / Committee
PI	Prof Holz, Carsten A.	Professor	Division of Social Science/The Hong Kong University of Science and Technology	0000-0003-1293-5578	No	

(b) Curriculum vitae (CV) of Applicant(s).

[For the PI and each Co-I, please attach a CV (a maximum of two <u>A4 pages</u> in standard RGC format for attaching PDF documents or a maximum of 800 words for direct input in the text box) per person in the following format.]

i) Name:
ii) Academic qualifications:
iii) Previous academic positions held(with dates):
iv) Present academic position:
v) Previous relevant research work:
vi) Publication records [Please refer to GRF 2 Part II Section 7 for the format required by the RGC]:

    Section A - Five most representative publications in recent five years

    Section B - Five representative publications beyond the recent five-year period with the latest publication entered first.

vii) Others (please specify):

(c) Plan(s) for collaboration in this application:

    [Indicate the role and the specific task(s) the PI <u>and</u> each Co-I , if any, is responsible for.]

    [Letter(s) of collaboration should be attached]

No Co-PI.

Below, I am being asked for the number of hours per week to be spent by the PI in the proposal. I think this is one year of intensive work for me (the PI), during which much (80%) of my research time will be taken up by this project. At the beginning and at the end, I expect that much less time input by me will be required, perhaps 25% of my research time.

☐   **I confirm that the Co-I(s) listed in the proposal have explicitly agreed to serve in the project team and a copy of the proposal has been provided to each of the Co-Is. Letter(s) of collaboration from the Co-I(s) is/are attached. I shall provide further documentary proof on the collaboration upon the request of the RGC / Secretariat.**

(d) Number of hours per week to be spent by the PI in the proposal: 15 hour(s)

CV of Prof Holz,Carsten A.

(i) Carsten A. HOLZ

(ii) PhD (Economics), Cornell University

(iii) 2014 – 2015 Visiting Professor, Department of Economics, Harvard University
2012 – 2013 Visiting Professor, Stanford Center for International Development, Stanford University
2010 – 2012 Visiting Professor, Department of Economics, University of Southern California
2010 – today Professor, Social Science Division, Hong Kong University of Science & Technology
2007 – 2008 Visiting Research Scholar, Princeton Institute for International and Regional Studies, and Visiting Associate Professor, Department of Economics and Woodrow Wilson School, Princeton University
2003 – 2004 Visiting Scholar, Asia-Pacific Research Center, Stanford University
2002 – 2010 Associate Professor, Social Science Division, HKUST
1999 – 2000 Visiting Assistant Professor, Department of Economics, Cornell University
1995 – 2002 Assistant Professor, Social Science Division, HKUST
1990 – 1991 Lecturer in economics at the (then) University of East Asia, Macau

(iv) Professor, Social Science Division, Hong Kong University of Science & Technology

(v)

Holz, Carsten A. and Yue SUN. "Physical Capital Estimates for China's Provinces, 1952-2015 and Beyond." In press, China Economic Review.

Holz, Carsten A. "New Capital Estimates for China." China Economic Review 17, no. 2 (2006): 142-85.

(vi.A)

"Industrial Policies and the Changing Patterns of Investment in the Chinese Economy." Forthcoming in The China Journal 81 (January 2019). Available at: https://ssrn.com/abstract=3221717.

"Physical Capital Estimates for China's Provinces, 1952-2015 and Beyond." With SUN Yue. In press, China Economic Review. Available at http://www.sciencedirect.com/science/article/pii/S1043951X17300913.

"Wage and Price Dynamics in China." With Aaron Mehrotra. The World Economy 39, no. 8 (Aug. 2016): 1109-27.

"The Quality of China's GDP Statistics." China Economic Review 30 (September 2014).

"Understanding Money Demand in the Transition from a Centrally Planned to a Market Economy." With Anne-Laure Delatte and Julien Fouquau. Post-Communist Economies 26, no. 3 (September 2014): 376-400.

(vi.B)
"The Unbalanced Growth Hypothesis Revisited: The Role of State Ownership in

China's Economic Growth." Journal of Development Economics 96, no. 2 (November 2011): 220-38.

"No Razor's Edge: Reexamining Alwyn Young's Evidence for Increasing Inter-Provincial Trade Barriers in China." The Review of Economics and Statistics 91, no. 3 (August 2009): 599-616.

"China's Economic Growth 1978-2025: What We Know Today about China's Economic Growth Tomorrow." World Development 36, no. 10 (October 2008): 1665-91.

"Revisions to China's GDP Data Following the 2004 Economic Census: More Questions Than Answers?" The China Quarterly, no. 193 (March 2008): 150-63.

"Spatial Price Differences in China: Estimates and Implications." With Loren Brandt. Economic Development and Cultural Change 55, no. 1 (October 2006): 43-86.

DECLARATION OF RELATED PROPOSALS & GRANT RECORD

[Please refer to GRF2 for information required and implications for non-disclosure of related research work]

[If you have difficulty in making the declaration, please explain.] Please add a new table for each project/proposal.

8. Grant Record of Investigator(s)

(a) PI - Details of research work undertaken and proposals submitted by the PI
   (in a PI/PC or Co-I/Co-PI capacity) including:

   (i)completed research work funded from all sources (irrespective of whether from UGC/RGC) in the past five years;

   (ii)on-going research work funded from all sources (irrespective of whether from UGC/RGC);

   (iii)proposals pending funding approval (irrespective of whether submitted to UGC/RGC);

   (iv)any related research work that is being / has been conducted in relation to the proposal (irrespective of whether from UGC / RGC and not limited to the past five years), including but not limited to data collection, preliminary research, working papers, publications (such as journal papers, conference papers and books, etc.), presentations, media interviews and other submitted proposals, etc. Please provide the details of the related research work (such as the title of the projects and / or papers / publications, or a brief description of the preliminary research work, etc.) whether or not such work was part of a funded project; and provide clarifications that distinguish that related research work from the work requested to be funded through this proposal. Any researcher who fails to disclose any related research work that is being / has been conducted in relation to the proposal will be subject to disciplinary action.

Completed

| 640413 | Role：PI | 01 Jan 14 – 30 Jun 17 | Non UGC/RGC Funding |

Funding Source(s) (Amount): GRF($780,000)

Project / Work Title:

The Process of Economic Development in West Sichuan, China

Project / Work Objective:

1. Document and evaluate processes and levels of economic development in West Sichuan
2. Document government economic development policies in West Sichuan and evaluate their effectiveness
3. Document and evaluate the economic and social consequences of economic development in West Sichuan

No. of Hours Per Week Spent by the PI *: 0

Related to the current application: NA

* The PI is not required to report on the time spent in the capacity of Co-I in GRF / Joint Research Schemes projects.

(b) Co-I(s) – Details of
   (i)on-going research work funded from all sources (irrespective of whether from UGC/RGC) undertaken by each Co-I (in a PI/PC capacity);
   (ii)proposals pending funding approval (in a PI/PC capacity).
   (iii)any related research work that is being / has been conducted in relation to the proposal (irrespective of whether from UGC / RGC and not limited to the past five years), including but not limited to data collection, preliminary research, working papers, publications (such as journal papers, conference papers and books, etc.), presentations, media interviews and other submitted proposals, etc. Please provide the details of the related research work (such as the title of the projects and / or papers / publications, or a brief description of the preliminary research work, etc.) whether or not such work was part of a funded project; and provide clarifications that distinguish that related research work from the work requested to be funded through this proposal.Any researcher who fails to disclose any related research work that is being / has been conducted in relation to the proposal will be subject to disciplinary action.

ANCILLARY INFORMATION

9. Research Ethics/Safety Approval and Access to Government/ Official/ Private Data and Records
[Please refer to GRF2 Part II Section 9 for the responsibilities and implications]

(a) Research Ethics/Safety Approval

(i) I confirm that the research proposal   ☐ **involves /**   ☑ **does not involve human subjects.**

(ii) Please tick the appropriate boxes to confirm if approval for the respective ethics and/or safety issues is required and has been / is being obtained from the PI's university. PIs are encouraged to seek necessary approval (except for human research ethics (clinical)) before application deadline as far as possible

	Approval not required	Approval being sought	Approval obtained

(1) Animal research ethics	☑	☐	☐
(2) Biological safety	☑	☐	☐
(3) Ionizing radiation safety	☑	☐	☐
(4) Non-ionizing radiation safety	☑	☐	☐
(5) Chemical safety	☑	☐	☐
(6) Human research ethics (non clinical)	☑	☐	☐

	Approval not required	Approval being sought	Approval obtained	Approval will be sought if funded
(7) Human research ethics (clinical)	☑	☐	☐	☐

(iii) If approval is required by <u>other</u> authorities, please indicate *below* the names of the authorities and the prospects of obtaining such approval. If not applicable, please put down "N.A.".

Nil

(b) Access to Government/ Official/ Private Data and Records

(i) Is access to Government / official / private data and records critical to the research proposal?

☐ Yes

☑ No

      If approval is required, please indicate below the names of the agency(ies) of obtaining such approval.

(ii) Please tick in the appropriate boxes to confirm if approval for access to the related data/records has been / is being obtained from the relevant agency(ies). If approval has been obtained, please provide evidence.

List of agency(ies)	Approval not required	Approval being sought	Approval obtained

[Note: PIs are encouraged to seek necessary approval before application deadline as far as possible.]

10.   **Release of completion report, data archive possibilities and public access of publications resulting from research funded by the RGC**

(a) Is the proposed project likely to generate data set(s) of retention value?

Yes   ☑   No   ☐

If yes, please describe the nature, quantity and potential use of the data set(s) in future.

Dataset of capital service and wealth capital values for China 1952–2017. To be made available online.

(b) Are you willing to make the data set(s) available to others for reference twelve months after the publication of research results or the completion of this proposed project?

Yes   ☑   No   ☐

I/We understand that the RGC will release the completion report to the public and only considers data archiving requests after the completion of the RGC-funded project. The RGC has full discretion in funding the archiving requests. Data sets archived with RGC funds will require users to acknowledge the originator and the RGC. The originator will also be provided with copies of all publications derived from the use of the data.

I undertake to include in the project completion report the URL links to the university's repository or the publisher's websites so that the public could have quick and easy access to the manuscripts or journal articles. I will also consider to include in the research completion report the data repository where research data of the project could be accessed and shared, where appropriate.

I undertake that upon acceptance of a paper for publication,

(i) I will check whether the publisher already allows (A) full open access to the publisher's version, or (B) my depositing a copy of the paper (either the publisher's version or the final accepted manuscript after peer-review) in the university's repository for open access;

(ii) if both (i) (A) and (B) are not allowed, I will request the publisher to allow me to place either version in my university's repository for restricted access immediately upon publication or after an embargo period of up to twelve months if required by the publisher; and

(iii) subject to the publisher's agreement on (i) or (ii) above, I will deposit a copy of the publication in my university's repository as early as possible but no later than six months after publication or the embargo period, if any.

11.   Education Plan, Technology Transfer Plan, Letters of Collaboration and Supporting Documents

(A maximum of 20 words for each box to caption each uploaded pdf document)

Appendix 1: Education Plan (up to one A4 page)

Letters of Collaboration List:

The employed Research Postgraduate Student will become thoroughly familiar with modern capital theory.