

The report of revisions to Reviewer 2's comments

After reading the comments, we realize that the paper lacks explanation on some key points. We accept all suggestions and revise the manuscript. It is expected that the manuscript is significantly improved. We greatly appreciate the reviewer's rigorous reading and kind suggestions.

This revision report consists of the reviewer's comments and our responses. We include all revisions in this report. For reading convenience, we provide responses in blue and highlight all revisions in this report and the revised manuscript.

Reviewer 2's comments and our responses

While the topic is interesting, I have some concerns about the assumptions and technical aspects of the analysis. First, was China (except Hong Kong, Macau, Taiwan) colonized by the western powers during 1896-1911 in the usual sense? The western established 'zujie' (concessions) in many trading ports, and they had administration power in those concessions. The scale of the concessions were limited, and at most China in that period was 'semi-colonized'. The paper uses the sample of all those firms in the provinces, some of them may not be influenced by the colonialism at all.

We appreciate the reviewer's rigid comment. We agree with the reviewer's option, China in that period was "semi-colonized," so we only argue the colonial power in some regions. In fact, we avoid using "colonized regions" in the manuscript.

Moreover, the reviewer concern that some regions may not be really under colonialism; this concern is reasonable, but as relevant historical materials suggest,

“The colonizers after 1895 launch serious competition and even wars (such as the war in 1905 between Russia and Japan) to control their regions. Not to mention wars, the competition also ends up with formal agreements about the division of China for their colonial influence (Hu, 1956). Hence, we can identify the regions under colonial powers with reference to those agreements and relevant historical evidence to justify the existence of colonial power.” (See the first paragraph of Section 2.1)

A new reference is added as the following.

Hu, B., 1956. Imperialism's conspiracy to divide up the interests of Chinese Railways at the end of the 19th Century (Shijiu Shiji Mo Diguozhuyi Guafen Zhongguo Tielu Quanli De Yinmouhuodong in Chinese). *Historical Research*, 5:89-104.

In section 2.1, some references are cited in the context, but cannot be found at the References part of the paper.

Sorry for that, we have already added the relevant reference in the manuscript now:

Tan, T., 1996. Zhang Taiyan. Chinese International Broadcasting Press, Beijing

Twichett, D. and Fairbank, J. K., 2008. The Cambridge history of China, Volumn 2. Cambridge: Cambridge University Press

Yang, Z. and Ye, F., 1993. Studies on Semi-colonization of Qing Dynasty. Higher Education Press, Beijing, China.

In section 2.2, the paper claims that the colonialism affects the present development through economic institution. Institution quality is measured by the average percentage of cases in legal disputes in which a company's legal contracts or properties are protected. The paper first assumes that the colonialism effects persistent (with some regressions later). The simple justification in the paper is not convincing.

Between 1911 and 2005, China changed so much politically, culturally and institutionally, and from the paper, ‘The Cultural Revolution during 1966-1976 destroyed all foreign and traditional products (Walder, 2014)’. How can the institutions established by the colonialism still remain? In equation (4), the paper finds the relationship between IQ (the institution quality) and the liberal colonialism. This cannot justify the persistence of the colonialism. The relation found in the OLS can be caused by the endogeneity, which is not dealt properly in the paper. A simple reason of the relationship between efficiency (and IQ) with the colonialism could be that the westerners chose the places that were easy to do the trade, easy to access through Changjiang river or through the sea, and those regions have better allocative efficiency and better protection of property right in the modern time.

We thank the reviewer for this kind reminder. After repeatedly reading this comment, we realized that we lacked explanation for the assumption. We add following sentences for justification:

“We emphasize economic institutions as the channel of liberal colonialism. This may be strong, but it is based on the reality in the regions under colonial powers (see Acemoglu et al., 2008). Specifically in China, most of the product of colonial power disappears because of wars, political changes and economic reforms since 1912; whereas the laws and other types of economic institutions are developed. For example, the Qing government in 1908 established the first constitution in China’s history (Cheng, 2017)” (Lines 8-15 in P5)

A new reference is added as the following.

Cheng, J., 2017. Why Late Qing Constitutional Reform Failed: An Examination from the Comparative Institutional Perspective. *Tsinghua Law review*, 107:107-147.

As for the endogeneity behind the relationship between IQ and the liberal colonialism,

for one thing, we undertake a series of test to justify the variable-omitting issue is not serious. For another, we control for some confounding factors to show that our results are robust:

“Given that the 19 open cities have incomparable role in economic growth, our results reveal that the effect of interest is robust to the later economic reform. Moreover, all the open cities are located in coastal regions, so our results suggest that our measurement of colonial power is less of the concern due to the geographic advantage in development.” (See the last paragraph of Section 4.2 in P15)

More theoretically, the exogeneity of liberal colonialism is reasonable because, as mentioned in the response to the first comment, the division of regions results from competition and war between those colonizers; the Qing government has no saying on it. Hence, which region under which country’s power is exogenous for Chinese regions.

In the end of section 4, the paper claims “we use tests to justify the endogeneity concern due to the measurement errors, confounders or omitted variables is negligible”. The real concern here is the endogeneity caused by the correlation of liberal colonialism with the error term, which may lead to a spurious outcome.

Yes, we agree with that the endogeneity should be caused by the correlation of liberal colonialism with the error term. As a thumb, to test the impact of the potential endogeneity, we undertake a series of tests to examine whether results are still robust after controlling additional or confounding factors. Once adding additional or confounding factors, the error item is changed. If the results are still robust, it

suggests the relationship of interest is robust to the error items (Altonji et al., 2005).

The endogeneity can be dealt with IV estimation if a valid IV can be found, as in Acemoglu et al. (2002). However, in section 5, the paper uses IV not to solve the endogeneity problem, but to claim that the colonialism takes effects through the institution. Equation (4) and (5) can justify the claim only if there is no problem of endogeneity. In the equation (1) and (2) of Acemoglu et al. (2002), it is pointed out that the key of that strategy is to find a good IV, and they used the mortality rate of the settlers as the IV. The current paper, as it appears now (especially from equation (6)), is running a 2SLS when IQ is endogenous, and LC is acted as an IV

Thank the reviewer for her kind comment. We suggest referring to Acemoglu et al. (2008) to this manuscript. What the reviewer mentions is Acemoglu et al. (2001) whose analysis uses a different framework.

Let us explain IV estimation in this paper: we expect that the colonialism has a persistent effect on allocative efficiency through economic institutions. In particular, we mention that “liberal colonialism as an exogenous source of economic institutions in China”. First, liberal colonialism generates an exogenous influence on China’s current allocative efficiency. Moreover, economic institutions are the channel of colonialism to affect the allocative efficiency. Following Acemoglu et al. (2008)’s method, we use the first-stage estimates to show the relationship from colonialism to economic institutions today and use the second-stage results to estimate how much liberal colonialism through economic institutions are identified to affect the allocative

efficiency (or how much economic institutions stemming from liberal colonialism affect the allocative efficiency). For better understanding on the IV strategy in our study, we add a new footnote (Footnote 4) in the manuscript:

“In theory, IV strategy identifies a mediation effect of the variable of interest through the IV on the dependent variable. This explains a number of literature uses IV estimation to show the mediation effect (e.g., Bretschger et al., 2012). In comparison, it requires the IV has only one channel (mediator) to affect the variable of outcome, so it is more strict than the traditional mediation-effect estimation, but it helps identify the causal effect from the IV on the variable of outcome through the channel.”

A new reference is added as the following.

Bretschger, L., Kappel, V. and Werner, T., 2012. Market Concentration and the Likelihood of Financial Crises, *Journal of Banking and Finance*, 36(12): 3336-3345.

The conclusion of this report

As described above, we have revised the paper by explaining the IV strategy with relevant reference and correcting the relevant sentences. These revisions suggested by reviewers help us to connect our work to the literature and the background. We thank the reviewers for those helpful comments.