

The Reversal of Fortune Thesis Revisited

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Abstract: Inspired by the Reversal of Fortune thesis proposed by AJR (2002), we question the institution hypothesis, which emphasizes the role of institutions of private property in the determination of long-term economic divergence. Given the presence of improved datasets, we adopted a similar framework to analyze the effect of European settlement. To better examine the conclusion of “the British settlement determines the institutional settings of property protection”, we select and discuss three potential problems that appeared in AJR (2002), including the avoidance of the African data, measurement bias of the variable “urbanization in 1500” and conceptional inaccuracy of the variable “population density in 1500 data”. Additionally, we replace the original IV variable “Log mortality” with an alternative IV variable entitled “European settlement in 1900” to double-check the explanation power of their institutional conclusion. We find that only British colonies experienced a positive effect of European settlement and the existence of the Reverse of Fortune phenomenon is largely because of the contribution of four countries: The United States, Canada, Australia, and New Zealand.

Keywords: long-term economic divergence, institutions of private property, the geography hypothesis, and European settlement in 1900

Introduction

What determines the long-term economic divergence and why do some parts of the world which were economically abundant in 1500 tend to be relatively poor now? The topic of “Reversal of Fortune” is systematically proposed by AJR (2002)¹. The authors propose that the reason why the places where enjoyed economic prosperity five hundred years ago are currently poor is because of the lack of full institutional protections².

Although we agree with the "institution matters" proposition, we would like to address potential areas of improvement in the original AJR (2002) methodology. Firstly, the authors’ measure of *urbanization in 1500* contains no data from Africa and thus only consists of limited observations. Absent of the data from the African continent, the authors’ *institution matters* arguments, to some extent, lose their theoretical generality. Indeed, some countries located on the western coast of Africa were relatively wealthy at 1500, but after experiencing European colonization (especially British colonization rule) for many centuries, these newborn African countries also adopted the institutional setting inherited from their colonizer. Then, why do the relatively same institutional settings generate sharply divergent economic outcomes for these African countries?

Secondly, it is likely that *population density in 1500* variable in the original paper incorrectly measured the total amount of arable lands. AJR (2002) implements data on arable land from Mcevedy and Jones (1978)³ that were subject to criticism in the academic community. For example, as Bandyopadhyay and Green (2012) point out, “Mcevedy and Jones (1978) sometimes present data on arable lands inaccurately. In 86 out of 91 observations used by AJR (2002), they list no

¹ Acemoglu, D., Johnson, S., & Robinson, J. A. (2002). Reversal of fortune: Geography and institutions in the making of the modern world income distribution. *The Quarterly journal of economics*, 117(4), 1231-1294.

² In AJR (2002), such institutional protection is named as *institutions of private property*.

³ McEvedy, C., & Jones, R. (1978). *Atlas of world population history*. Penguin Books Ltd, Harmondsworth, Middlesex, England.

data on arable land, leading the authors of AJR (2002) to see all land as arable for these observations”⁴. Following their instructions, we analyzed the variable *population density in 1500* and found that AJR (2002) labels the percentage measurements of exemplified countries like Canada and Australia as 100, which is highly problematic given the massive coverage of deserts and frozen lands in Australia and Canada, respectively.

Thirdly, AJR (2002) overestimates the role of European institutions. We believe that what leads to the authors’ proposal that institutions of private property determine the long-term economic divergence is the factual economic prosperity exclusively among the Neo-Europe. Although European settlement does, to some extent, work as a positive force for better property protection, there is no evidence of a significantly general relation between European colonization, institutions of property rights, and long-term economic development. Instead, we propose that it is the *British* settlement that helps to explain the core reason why a long-term economic divergence happens. We find out that nine out of ten highest-score countries, which value the protection of property rights, are former British colonies and four of the top five states are from North America and Australasia⁵. Therefore, AJR (2002) overreaches the importance of institutional protections by generalizing the wisdom which applies in Five-Eye Alliance to the whole world.

Lastly, we believe that for the IV 2SLS estimation adopted in the original paper, another IV variable could be applied as a robustness check. This IV variable is *European settlement in 1900* and it was implemented in AJR (2001). Following the logic induction of AJR (2002), the variable "Log mortality" which presents log-formation of estimated settler mortality is *positively* related to the variables that measure pre-modern economic prosperity. The intuition is that the first-round

⁴ Bandyopadhyay, S., & Green, E. (2012). The reversal of fortune thesis was reconsidered. *Journal of Development Studies*, 48(7), 817-831.

⁵ Acemoglu, D., Johnson, S., & Robinson, J. A. (2001). The colonial origins of comparative development: An empirical investigation. *American economic review*, 91(5), 1369-1401.; Fails, M. D., & Krieckhaus, J. (2010). Colonialism, property rights, and the modern world income distribution. *British Journal of Political Science*, 487-508.

settlers in 1500 (mainly the Spanish and Portuguese) were inclined to embark on economically abundant places, leaving them a higher probability to meet local deathful diseases that settlers were not immunized from. The case for the following-wave settlers, which were mostly French and British, was quite different. Because the new lands with the most abundant resources had already been occupied, British and French settlers were forced to move north to settle on places that were relatively poor and lacked deathful tropical diseases. As a result, it is likely that the descendants of the first wave of European settlers did not recover a significant percentage of population by 1900, while the percentage of the 1900 population who were the direct descendants of the *British* colonizers was significantly higher. Our intuition is supported by AJR (2000) data, which indicates that 4 out of the top 5 British colonies have populations among which at least 88% are British descendants⁶. Thus, we propose that variable institution is also *positively* correlated with our proposed IV variable *European settlement in 1900*.

We find out that after including the relevant African data and the new measurement of the controlled variable *population density in 1500*, the statistical significance of the institution hypothesis still preserves. It is also clear that by implementing a new IV 2SLS estimation, settlements only in British colonies have positive effects and such significant effects of property-protection institutions are largely restricted to four countries: The United States, Canada, Australia, and New Zealand.

This paper is organized as follows. Section two combines a literature review and a concentrated presentation of diverse theories that explain the topic of “long-term economic divergence”. In section three, we discuss the major problems of the original AJR (2002), followed by our presented solutions and the detailed measurements of newly-included variables. Section four is focused on

⁶ Albouy, D. Y. (2008). *The colonial origins of comparative development: an investigation of the settler mortality data* (No. w14130). National Bureau of Economic Research.

the presentation of results. Section five concludes.

Literature Review and Theory Presentation

There mainly exist four major schools of thought that help to explain a long-term economic divergence after the *Great Geographical Discovery*.

A. The Geography Hypothesis

The geography hypothesis claims that differences in economic performance reflect differences in geographic, climate, and ecological characteristics across countries. Diamond (1999) and Sachs (2001, 2003)⁷ argue that geographical factors play a significantly important role in the economic development of a pre-modern agricultural society. That is why, standing on the time spot of 1500, the relatively wealthy countries were concentrated in places of good geographical factors, such as latitudes, access to seas, abundant rainfall level, and vast arable lands. Given the fact that the economic prosperity of an agricultural society is determined by natural factors, the better heat and rainfall condition one state receives, the more arable land one state has, the more economically prosperous one agricultural state may be. We hold no objection to this proposal.

However, after the discovery of the New World, consecutive rounds of the Industrial Revolution have been witnessed globally. The dominant economic engine of one *modern* country has gradually transitioned from the First Industry to the Second Industry. Under this circumstance, natural factors such as arable lands and latitude level turned out to be not as important as before. Therefore, it is intuitive that the economic divergence which mainly happened during the intersection of the First

⁷ Diamond, J. (1997). *Guns, Germs and Steel: The Fates of Human Societies*, Vintage.; McArthur, J. W., & Sachs, J. D. (2001). *Institutions and geography: comment on Acemoglu, Johnson, and Robinson (2000)* (No. w8114). National bureau of economic research.; Sachs, J. D. (2003). *Institutions don't rule: direct effects of geography on per capita income* (No. w9490). National Bureau of Economic Research.

Industrial Revolution and the Second Industrial Revolution was not mainly related to the difference of inter-state graphical factors. It must be related to something else.

B. The Institution Hypothesis

According to the institution hypothesis, societies with a social organization that encourages investment will enjoy long-time economic prosperity. Smith (1937), Hayek (1960) and Locke (1967), together with Douglas North (1991) and many other distinguished economic-history papers extremely value the importance of property rights for the success of the nations⁸. Exclusively among the American continent, what could be immediately discovered is the institutional difference between countries with Spanish colonization history and the northern Neo-Europe states that inherit British institutions of property protection. To be precise, the Spanish institutional settings of property preservation were not based on a whole system of expropriation. Its main problem, as illustrated by North and Weingast (1989)⁹, was that unlike the British tradition of developing institutional property protections that covered *each* citizen's economic interests, its Spanish counterpart only protected the economic benefit of *the privileged few*, leaving the general mass's incentive of investments not *fully* occupied. This difference in terms of institutional setting partly explains why most Latin American countries gradually lagged behind Canada and the United States in terms of economic prosperity. This reasoning goes in line with the idea proposed by AJR (2002) that different institutions of property rights determined long-term economic divergence.

C. The Integration Hypothesis

The Integration hypothesis emphasizes the role of leading positions on the determination of

⁸ Locke, J. (1967). *Locke: Two treatises of government*. Cambridge University Press.; Smith, A. (1937). *The wealth of nations*. modern library. New York, 423.; Von Hayek, H. (1960). *The human lung*. Hafner Publishing Company.; North, D. C. (1990). *Institutions, institutional change, and economic performance*. Cambridge university press.

⁹ North, D. C., & Weingast, B. R. (1989). Constitutions and commitment: the evolution of institutions governing public choice in seventeenth-century England. *Journal of economic history*, 803-832.

long-term economic difference. As illustrated in Rodrik, Subramanian and Trebbi (2004)¹⁰, the geographical hypothesis and the institution hypothesis both assume that *domestic* factors explain the difference in economic prosperity. Integration hypothesis questions this idea. Since the Great Discovery, the whole world had been closely united under the group of western countries that sought economic dominance. Coincidentally, these current or used-to-be economic dominators happened to take the majority of the existing wealthy countries. Although it is logically clear that institutions did matter, supporters of the integration hypothesis suggest that the external secret of being economically wealthy depends on whether a state was within the group of global trade rule-makers. The countries which controlled the direction of global trade integration were prone to use their dominant positions to carry out international expropriation and diversify their international investment portfolios. Following this logic, it is the position or the integration that fundamentally determines why some countries that used to be relatively wealthy in 1500 are currently lagged in terms of economic prosperity. The answer is simple: *these countries were not politically dominant on the stage of global rule-settings*¹¹.

Due to the limitation of time and corresponding data, we are not currently capable of testing the validity of this integration hypothesis and the consistency between position theory and data confirmation. Research results by Austin (2008), Enterline, Stull and Magagnoli (2013), and Hopkins (2009)¹², established that “once institutions are controlled for, integration has *no* direct effect on incomes”¹³, we tend to believe that the quality of institutions trumps the other two factors.

¹⁰ Rodrik, D., Subramanian, A., & Trebbi, F. (2004). Institutions rule: the primacy of institutions over geography and integration in economic development. *Journal of economic growth*, 9(2), 131-165.

¹¹ Austin, G. (2008). The ‘reversal of fortune’ thesis and the compression of history: perspectives from African and comparative economic history. *Journal of International Development: The Journal of the Development Studies Association*, 20(8), 996-1027.

¹² Austin, G. (2008). The ‘reversal of fortune’ thesis and the compression of history: perspectives from African and comparative economic history. *Journal of International Development: The Journal of the Development Studies Association*, 20(8), 996-1027.; Enterline, A. J., Stull, E., & Magagnoli, J. (2013). Reversal of fortune? Strategy change and counterinsurgency success by foreign powers in the twentieth century. *International Studies Perspectives*, 14(2), 176-198.; Hopkins, A. G. (2009). The new economic history of Africa. *Journal of African history*, 155-177.

¹³ Rodrik, D., Subramanian, A., & Trebbi, F. (2004). Institutions rule: the primacy of institutions over geography and integration

Therefore, the prioritized focus of this paper is to improve the validity and decrease the appliance coverage of the institution hypothesis.

D. The Initial Inequality Hypothesis

The initial inequity hypothesis functioned as a theoretical proposition from the institution hypothesis that AJR (2002) establishes. The core of this theory is that history reproduces itself and that “societies which began with more extreme inequality were most likely to develop institutions allowing much of the population only limited access to economic opportunities”¹⁴. Hoff (2004)¹⁵ believes that exclusively focusing on the process of Spanish settlement in the early 1500s, AJR (2002)’s “institution matters” proposal which forms on the high mortality rate of the first-wave settlers is not *enough*. Although generally agreeing with AJR (2002)’s main arguments, professor Hoff makes a clear statement that the total number of all the first-wave Spanish colonizers was limited. Given the fact that the lands they conquered were occupied by successful and wealthy agricultural societies, which had established matured institutions of taxation expropriation¹⁶, the Spanish conquerors relied on the pre-existing extreme inequality, to kill the original emperors and to form new ruling coalitions centered around them through intermarrying with the existing local elites. Looking through authoritative historical records, we agree with professor Hoff’s inequality manipulation proposal¹⁷.

in economic development. *Journal of economic growth*, 9(2), 131-165.

¹⁴ Hoff, K. (2003). Paths of institutional development: a view from economic history. *The World Bank Research Observer*, 18(2), 205-226.

¹⁵ Hoff, K. R., & Pandey, P. (2004). *Belief systems and durable inequalities: An experimental investigation of Indian caste* (Vol. 3351). World Bank Publications.

¹⁶ In other words, Spanish America was a highly matured caste society where *the aristocratic few ruled the general mass*. See the related information at Sokoloff, K. L., & Engerman, S. L. (2000). Institutions, factor endowments, and paths of development in the new world. *Journal of Economic perspectives*, 14(3), 217-232 and Engerman, S. L., & Sokoloff, K. L. (2002). *Factor endowments, inequality, and paths of development among new world economics* (No. w9259). National Bureau of Economic Research.

¹⁷ De La Escosura, L. P. (2004). When Did Latin America Fall Behind? Evidence from Long-run International Inequality. In *Universidad Carlos III, Madrid. presented at the Inter-American Seminar on Economics* (pp. 2-4).; Fukuyama, F. (Ed.). (2008). *Falling behind: explaining the development gap between Latin America and the United States*. Oxford University Press.; Fagerberg, J., Srholec, M., & Knell, M. (2007). The competitiveness of nations: Why some countries prosper while others fall

Unlike the Spanish conquerors, the following-wave British and French settlers were forced to set on the lands that were characterized as “*labor scarcity* in the economic organizations of the early colonies”¹⁸. Thus, they could only rely on the collective formation and "reproduction" of British institutions of private property in order to maximize each settler's determination of survival. In other words, the presence of economic equality among the British settlement “reproduced” institutions that allowed the majority of the population to have *full* access to economic-interest protection and economic opportunities.

We generally agree with the initial inequity hypothesis proposed by Hoff (2003, 2004). However, due to the absence of data on economic and social inequality in the 1500s, this argument should be treated as a theoretical proposition rather than a matured theory. In this paper, we focus on potential measurement errors in the original AJR (2002), followed by further testing the validity of the "institution matters" argument via a new IV variable, *European settlement in 1900*.

Regression Methodology and Major Problems for AJR (2002)

A. Regression Equation

Our paper adopts the same setting of regression equations like AJR (2002). The regression estimation is based upon a combination of OLS and IV 2SLS analysis. Again, the puzzle of this paper is to re-estimate the institution hypothesis which claims that the institution of property right determines the long-term economic divergence between 1500 and current days.

Among the regular OLS estimation, our regression equation is presented as follows:

$$y_{it} = \mu_t + \delta_i + \pi * X_{it} + Z_{it} + \epsilon_{it}$$

behind. *World development*, 35(10), 1595-1620.

¹⁸ Galenson, D. W. (1996). The settlement and growth of the colonies: population, labor, and economic development. *The Cambridge economic history of the United States*, 1, 135-207.

Here y_{it} is the outcome variable of current economic prosperity in country i at date t . δ_i and μ_t represent the country fixed effect and the time effect, respectively. X_{it} is our focused target, represented by *institution* measurements, which is defined as the measurement of institutions of country i at date t . Z_{it} stands for the controlled variables, which represents combined variables like *urbanization in 1500* and *log population density in 1500*.

As for the IV 2SLS estimation, our combined set of regression equations is presented below:

$$\text{First – stage regression: } X_{it} = \gamma * IV_{it} + Z_{it} + v_{it}$$

$$\text{Second – stage regression: } y_{it} = \mu_t + \delta_i + \tilde{\pi} * \hat{X}_{it} + Z_{it} + U_{it}$$

Here IV_{it} represents the IV variable in country i at date t . Our main focus is the direction and the statistical significance of coefficient $\tilde{\pi}$.

B. AJR (2002) 's major problems and our suggested solution for each problem

We propose four major areas for potential improvement in AJR (2002). Following the discussion of each issue, we present our proposed solution. Firstly, the authors' measure of *urbanization in 1500* contains limited observations due to the absence of data from the African continent. Without the relevant data obtained from Africa, the authors' *institution matters* argument may lose its theoretical generality. AJR (2002) typically implements data from Bairoch (1988)¹⁹ and Eggimann (2000)²⁰, where the authors successfully transform Eggimann (2000)'s 1500 urbanization dataset which is formed upon cities with a population of more than 20000 people compared to a 5000-person minimum which is consistent with the population measurement of Bairoch (1988). Historians generally agree with the conclusion that “data on small-to-middle ancient cities could

¹⁹ Bairoch, P. (1988). *Cities and economic development: from the dawn of history to the present*. University of Chicago Press.

²⁰ Eggimann, G. (2000). *Population des villes des tiers mondes de 1500 à 1950*.

be inaccurate for the reasons that abandoned cities can disappear over time and that migration routes can make it difficult to measure cities' permanent populations"²¹. Therefore, it may be wiser to increase the measurement benchmark of the "urbanization in 1500" to exclusively focus on the population of large cities.

To correct for this measurement problem, we implement Chandler (1987)'s data on cities with a population of more than 20000 among the continent of Africa and America as an alternative variable measurement²². The implementation of an alternative dataset has two advantages. Firstly, this dataset comes from a single source, which drastically decreases the potential error generated by the merge transformation. Secondly and more importantly, this new dataset allows us to include 43 cities in Africa for 1500, despite AJR (2002)'s claims that they need to exclude African data because such a population measurement is not "detailed" enough.

Secondly, the authors' measurement of *population density in 1500* may not accurately reflect the total amount of arable lands. AJR (2002) data on arable lands was implemented from Mcevedy and Jones (1978)²³, whose dataset was critiqued for measurement biases by Bandyopadhyay and Green (2012). The authors point out that, "Mcevedy and Jones (1978) sometimes present data on arable lands inaccurately. In 86 out of 91 observations used by AJR (2002), they list no data on arable land, leading the authors of AJR (2002) to see all land as arable for these observations"²⁴. After analyzing the variable "*population density in 1500*" in AJR (2002) we find that the authors label the percentage of arable lands in countries like Canada and Australia as 100, which is highly unlikely due to massive coverage of deserts in Australia and frozen lands in Canada. In order to

²¹ Bandyopadhyay, S., & Green, E. (2012). The reversal of fortune thesis reconsidered. *Journal of Development Studies*, 48(7), pp. 818.

²² Chandler, T. (1987). *Four thousand years of urban growth: An historical census*. Mellen.

²³ McEvedy, C., & Jones, R. (1978). *Atlas of world population history*. Penguin Books Ltd, Harmondsworth, Middlesex, England.

²⁴ Bandyopadhyay, S., & Green, E. (2012). The reversal of fortune thesis reconsidered. *Journal of Development Studies*, 48(7), 817-831.

correct for this measurement inaccuracy, we implement data from FAO (2000)²⁵. Austin (2008)²⁶ suggests that “FAO (2000) is the first-time estimated global dataset for land that is potentially arable for growing any one of the 21 major crops under rain-fed conditions”, which allows us to get access to the pre-modern agricultural societies where modern agriculture technology has not been adopted yet. One advantage of FAO (2000)’s implementation compared to AJR (2002) is the possibility to *exclude* the amount of non-arable lands such as deserts, mountains, frozen areas. After substituting Mcevedy and Jones (1978)’s measurement with the corresponding figures of FAO (2000), we are confident that the measurement accuracy of variable *population density* in 1500 improves significantly.

Thirdly, we believe that IV variable *European settlement in 1900* used in AJR (2001) can be implemented as a robustness check for the IV 2SLS estimation in the AJR (2002). The authors used “Log mortality” as an IV due to its *positive* relationship with the variables that measure pre-modern economic prosperity. The logic is that the first-round settlers (mainly the Spanish and Portuguese), who occupied more economically abundant lands, had a higher chance of getting sick with a deadly tropical disease like malaria compared to the second-wave of French and British settlers who occupied lands to the north and were less likely to get infected. Hence, we believe that *the European settlement in 1900* variable, which measures the percentage of the 1900 population who were direct descendants of the first settlers, may reflect the same intuition as the variable “Log mortality” in the original AJR (2002). Data obtained from AJR (2000) supports our reasoning — 4 out of the top 5 British colonies have populations among which at least 88% are British decedents²⁷. For these reasons, we argue that variable institution is also *positively* correlated

²⁵ Bot, A., Nachtergaele, F., & Young, A. (2000). *Land resource potential and constraints at regional and country levels* (No. 90). Food & Agriculture Org.

²⁶ Austin, G. (2008). The ‘reversal of fortune’ thesis and the compression of history: perspectives from African and comparative economic history. *Journal of International Development: The Journal of the Development Studies Association*, 20(8), 996-1027.

²⁷ Albouy, D. Y. (2008). *The colonial origins of comparative development: an investigation of the settler mortality data* (No.

with our proposed IV variable *European settlement in 1900*.

Lastly, we tend to believe that the role of European institutions was overestimated in AJR (2002). In fact, the authors' proposal that institutions of private property determine the long-term economic divergence can be attributed to the factual economic prosperity among the Neo-Europe. Admittedly, European settlement may be positively correlated with better property protection, but there is no evidence of a significantly general relation between European colonization, institutions of property rights, and long-term economic development. On the contrary, we argue that British settlement can explain the roots of long-term economic divergence. We find that 9 out of 10 highest-score countries, which value the protection of property rights, are former British colonies. Therefore, the effect of institutional protections was confused with the effect of property protection in British settlements. This argument is illustrated in Table 1 in the Appendix.

To support this argument econometrically, we create a dummy variable *Britain* to represent the history of British colonization. If the answer is Yes, then variable *Britain* is coded as 1, otherwise, it is 0. We incorporated this dummy and modified our base OLS regression as follows:

$$y_{it} = \mu_t + \delta_i + \beta * Britain_{it} * X_{it} + Z_{it} + \epsilon_{it}$$

where $Britain_{it}$ represents whether one state i receives British colonization or not at year t . Our focus is the direction of coefficient β . Then, we deleted all the data collected from the *Neo-Europe* countries on the measurement of institutional settings for property protection and repeated the original AJR (2002)'s baseline testing. These combined two robustness checks are designed to illustrate the fact that the existence of the Reverse of Fortune phenomenon is largely attributed to four former British colonies: The United States, Canada, Australia, and New Zealand.

w14130). National Bureau of Economic Research.

Table 2 in the Appendix presents the baseline descriptive statistics. The dependent variable of this extension is the log-form GDP Per Capita in 1995 (*logpgp95*) adopted from the original AJR (2002) dataset. After including the missing African data and remeasuring the variable *population density in 1500* with a more accurate estimation of *total arable land*, we implement major two control variables as *Improvedsjb1500* which means improved urbanization measurement in 1500, and *Improvedlpd1500s* which represents log-form population density in 1500. For simplicity and without losing representativeness, we adopt the *Avexpr* measurement as one proxy of the institution setting of private property. Standing for *average protection against expropriation risk from 1985 to 1995*, this variable measures risks of expropriation of foreign investment by government, from 0 to 10, where a higher score generally means less risks. We also include the statistical summary of one targeted IV variable *Euro1900* which represents the meaning of *European settlement in 1900*. This IV variable measures the percentage of each including state's population that is European or descendants of European settlers.

Results

After including the relevant African dataset and redefining one control variable *lpd1500s* with a more accurate denominator measurement, we present our improved baseline regression tables, with *Improvedsjb1500* and *Improvedlpd1500s* each presenting the economic prosperity of the states in 1500. Please refer to the detailed information at Table 3 and Table 4 in the Appendix.

Column (1) of both Table 3 and Table 4 reaffirms the existence of the Reverse of Fortune phenomenon. After introducing control variables that measure economic abundance of targeted states at 1500 into Table 3 (*Improvedsjb1500*) and Table 4 (*Improvedlpd1500s*), the results become significantly diverse. From the remaining columns of Table 3, it is clear that after the inclusion of

institution of private property right, the variable *Improvedsjb1500* loses its statistical significance immediately, which implies that the establishment of legal and legitimate protection of private property rights could largely explain the reasons why long-term economic divergence happens.

After including the variable *Avexpr*, the coefficients of *Improvedlpd1500s*, under most cases remain statistically significant. This echoes the acknowledged fact from the original authors that compared to the explanation power of variable *urbanization rate in 1500*, the corresponding compatibility of variable *population density in 1500* is lagged. However, in column (2), we could still find out that after controlling the continent dummies, the coefficient of measurements of population density is negative and statistically insignificant, whereas its institutional counterpart remains positive and significant even at a 0.1% statistic level. Even under the cases of significance maintenance of *Improvedlpd1500s*, it is clear that the coefficients of property protection are all positive and highly significant, which indicates that a higher level of institutional preservation is associated with more prosperous economic performance in 1995.

Apart from the baseline regressions, we also introduce the Britain dummy to differentiate the diverse origins of European colonization. We deliberately introduce the intersection term between the Britain dummy variable and the variable *Avexpr* so that the contribution of Britain settlement on the preservation of private property rights can be captured. We also create a Neo-Europe dummy variable, which represents a country combination of the United States, Canada, Australia and New Zealand. By generating this dummy variable, we could temporarily delete the existence of four countries and see its correlated impact on the maintenance of the “Reverse of Fortune” phenomenon. Please refer to Table 5 and Table 6 in the Appendix for detailed information.

From the column (1) and (2) of Table 5, we discover that after excluding four New-Europe states, this significance of the improved measurement of *urbanization in 1500* disappears, which

reaffirms our original hypothesis that the existence of Reverse of Fortune phenomenon is largely supported by four representative countries: The United States, Canada, Australia, and New Zealand. What's more, after the inclusion of variable *Britain_Avexpr*, we find out that the statistical significance of institutional protection also disappears and that the coefficient of the intersection term between Britain colonization and average protection against expropriation risk becomes numerically positive and statistically significant, which indicates that the explanation of variable *Avexpr* is substantially contributed by the only British legacy of property preservation. Again, this judgment is consistent with our original hypothesis that it is only in British colonies that settlements develop positive effects.

As a comparison, after the temporary exclusion of the existence of four Neo-Europe states, the targeted variable *Improvedpd1500s* still maintains its negative numerical numbers and statistical significance even at the 0.1% level. In the column (3) and (4) of Table 6, we can observe that the coefficients of property protection remain highly positive and statistically significant together with a positive and significant intersection term named *Britain_Avexpr*. This situation implies that apart from the contribution of the British legal arrangement of private property preservation, there exist other missing factors, which help explain why better protection of private property would lead to better long-term economic developments.

Lastly, we also redo the original IV 2SLS estimation by implementing a new IV variable. This time, we borrow one ideal variable entitled *Euro1900* from AJR (2001), which represents the percentage of each including state's population that is European or descendants of European settlers at 1900. Just because of the unexplained influence of variable *Improvedpd1500s*, we worry that many other factors that can substantially explain the positive contribution of institutional settings may be missing. In other words, our OLS regression may embrace a missing variable

problem, which is very likely to cause biasedness in the presentation of coefficient and significance. Focusing on the target variable *Avexpr*, we believe that it is a practical need to redo the IV 2SLS estimation as a sound robustness check.

Given the analysis and argumentative support provided in previous sections of the paper, we propose that variable institution is also positively correlated with our proposed IV variable *European settlement in 1900*. The first-stage results of *Euro1900*-driven IV estimations confirm the legitimacy of our theoretical inductions. We think that is highly unlikely that the measurement of the percentage of the population that is European or of European decedents in 1900 can explain the result of economic prosperity in 1995. We think that even mature scholars will not be able to imagine the explanation power of an argument like "*previous* composition of the population can explain *current* economic prosperity". Therefore, we tend to believe that there is no causal linkage between IV variable *Euro1900* and the major dependent variable *Logpgp95*. See the detailed information at Table 7.1 and Table 8.1 in the Appendix.

We present the second-stage results of two IV 2SLS estimations by the implementations of variable *European settlement in 1900*. Please refer to the detailed information at Table 7.2 and Table 8.2 in the Appendix. The results of all columns in Table 7.2 and Table 8.2 echo our worry that the missing variable problem does exist in the original AJR (2002). Under the IV 2SLS estimation, the coefficients of variable *Improvedsjb1500* in Table 7.2 and variable *Improvedlpd1500s* in Table 8.2 lose statistical significance immediately, although preserving numerical features of being negative. As a comparison, the measurement of institutional protection, among the same columns, remains numerically positive and statistically significant. The second-stage results tell us that the maintenance of long-term economic divergence is substantially supported by diverse institutional settings of private property protection, which is consistent with

the original authors' conclusion.

Conclusion

This research serves as an extended replication of AJR (2002). Focusing on the *Reversal of Fortune* thesis, we question the institution hypothesis, which emphasizes the role of institutions of private property in the determination of long-term economic divergence. We adopt a similar framework to address potential problems in the original AJR (2002) paper. We discover that after including the relevant African data and the new measurement of the controlled variable *population density in 1500*, the statistical significance of the institution hypothesis is still well-preserved. Furthermore, by excluding four Neo-Europe countries and including one interaction term between the Britain dummy and the institutional protection, we are assured that the settlement had a positive effect in British colonies and that the existence of *the Reverse of Fortune* phenomenon can largely be attributed to four countries: The United States, Canada, Australia, and New Zealand. Two following-up IV-2SLS estimations implemented by a new IV variable *Euro1900* also reaffirm the explanation power of the original Institution Hypothesis.

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Appendix

Table 1, Top 10 countries/areas that protect private property in AJR (2001, 2002)

	Average Protection against Expropriation Risk, 1985 – 1995	The origin of colonization
The United States	10	Britain
Canada	9.73	Britain
New Zealand	9.73	Britain
Australia	9.32	Britain
Singapore	9.32	Britain
India	8.27	Britain
The Gambia	8.27	Britain
Hong Kong, China	8.14	Britain
Malaysia	7.95	Britain
Brazil	7.91	Portugal

Source: AJR (2000, 2001, 2002)

Table 2: Selective Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Logpgp95	41	8.458	.881	6.877	10.216
Improvedsjb1500	41	6.385	4.953	0	17.79
Improvedlpd1500s	41	.233	1.921	-3.831	4.61
Avexpr	39	6.883	1.451	3.727	10
Cons90	38	4.868	2.056	1	7
Cons1	39	3.333	2.517	1	7
Euro1900	41	23.229	28.671	0	99

Table 3: *Improved* Urbanization in 1500 and GDP per Capita in 1995

	(1)	(2)	(3)	(4)
	Base Model_ Urbanization 1500	Model2_ Urbanizati on 1500_Continent	Model3_ Urbaniz ation 1500 Latitude	Model4_ Urbanizat ion 1500 Resources
Improvedsjb1500	-0.0783** (0.0256)	-0.00844 (0.0112)	-0.0340 (0.0185)	-0.0301 (0.0167)
Avexpr		0.452*** (0.0377)	0.428*** (0.0645)	0.419*** (0.0586)
America		-0.955 (0.574)		
Africa		-0.525 (0.773)		
Asia		-1.326* (0.607)		
Lat_abst			1.420 (0.917)	
Coal				0.112 (0.278)
Landlock				-0.541 (0.478)
Island				0.271 (0.331)
Gold				0.127 (0.106)
Iron				0.0429 (0.0921)
Silver				0.119 (0.0723)
Zinc				-0.105 (0.125)
Oil				0.000000126 (0.000000273)
Constant	8.958*** (0.206)	9.951*** (0.542)	8.614*** (0.300)	8.625*** (0.310)
<i>N</i>	41	41	41	41

Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 4: *Improved* Population Density in 1500 and GDP Per Capita in 1995

	(1)	(2)	(3)	(4)
	Base Model_Density 1500	Model2_Density 1500 Continent	Model3_Density 1500 Latitude	Model4_Density 1500 Resources
Improvedlpd1500s	-0.336*** (0.0499)	-0.0697 (0.0381)	-0.234*** (0.0547)	-0.158** (0.0500)
Avexpr		0.547*** (0.0410)	0.390*** (0.0618)	0.360*** (0.0545)
America		-0.519 (0.435)		
Africa		0.367 (0.581)		
Asia		-0.432 (0.483)		
Lat_abst			1.030 (0.699)	
Coal				0.171 (0.215)
Landlock				-0.668 (0.370)
Island				0.275 (0.244)
Gold				0.0798 (0.0815)
Iron				-0.0109 (0.0721)
Silver				0.0496 (0.0548)
zinc				-0.0409 (0.0968)
Oil				0.000000158 (0.000000208)
Constant	8.536*** (0.0955)	8.932*** (0.426)	8.312*** (0.179)	8.377*** (0.159)
N	41	41	41	41

Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 5: *Improved* Urbanization in 1500 and GDP Per Capita in 1995 (Two Exclusions of Neo-Europe and Two Inclusions of Britain Dummy)

	(1)	(2)	(3)	(4)
	Base Model_Urban 1500_NoNeoEurope	ModelAll_Urban 1500_NoNeoEurope	Model3_Urban 1500_British Rule	ModelAll_Urban 1500_British Rule
Improvedsjb1500	-0.0415 (0.0266)	-0.0428 (0.0308)	-0.0559* (0.0245)	-0.0541* (0.0260)
Avexpr			0.125 (0.1052)	0.133 (0.1242)
Lat_abst		-0.656 (1.281)		-0.311 (1.283)
Gold		0.102 (0.452)		0.0833 (0.114)
Iron		-0.0962 (0.699)		0.0490 (0.0938)
Silver		0.0801 (0.208)		0.151 (0.0757)
Zinc		-0.0568 (0.487)		-0.109 (0.131)
Oil		0.000000266 (0.000000548)		4.78e-08 (0.000000277)
Britain_Avexpr			0.101** (0.0321)	0.0984* (0.0400)
Constant	8.570*** (0.228)	8.657*** (0.332)	9.037*** (0.223)	8.932*** (0.414)
<i>N</i>	85	85	37	37

Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 6: Improved Population Density in 1500 and GDP Per Capita in 1995 (Two Exclusions of Neo-Europe States and Two Inclusions of Britain Dummy)

	(1)	(2)	(3)	(4)
	Base Model_Density 1500_NoNeoEurope	ModelAll_Density 1500_NoNeoEurope	Model3_Density 1500_British Rule	ModelAll_Density 1500_British Rule
Improvedpd1500s	-0.312*** (0.0638)	-0.226*** (0.0587)	-0.157*** (0.0433)	-0.173*** (0.0504)
Avexpr			0.351*** (0.0571)	0.263*** (0.0679)
Lat_abst		1.189 (0.803)		0.238 (0.859)
America		0.190 (0.245)		
Africa		-0.759** (0.228)		
Gold		0.0230 (0.0188)		0.0546 (0.0862)
Iron		-0.0120 (0.131)		0.00110 (0.0731)
Silver		0.0357 (0.0442)		0.0535 (0.0574)
Britain_Avexpr			0.0885*** (0.0242)	0.162*** (0.0424)
Zinc				-0.0427 (0.103)
Oil				0.000000162 (0.000000207)
Constant	8.007*** (0.0956)	8.061*** (0.250)	8.503*** (0.0858)	8.403*** (0.179)
<i>N</i>	86	85	47	47

Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 7.1 First-Step IV-2SLS Estimation of Institution_Urbanization in 1500 and GDP Per Capita in 1995

Instrumented Variable	Instrument Variable	Coefficient and Significance	Constant	Control Variables	R ²
Avexpr	Euro1900	1.149*** (0.311)	11.159*** (1.692)	Yes	0.554
Standard errors in parentheses			* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$		

Table 8.1 First-Step IV-2SLS Estimation of Institution_Population Density in 1500 and GDP Per Capita in 1995

Instrumented Variable	Instrument Variable	Coefficient and Significance	Constant	Control Variables	R ²
Avexpr	Euro1900	0.341* (0.160)	7.351*** (1.105)	Yes	0.408
Standard errors in parentheses			* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$		

Table 7.2: IV-2SLS Estimation of Institution_Urbanization in 1500 and GDP Per Capita in 1995

	(1)	(2)	(3)	(4)
	IV2SLS_Urban 1500_Base	IV2SLS_Urban 1500_Independence	IV2SLS_Urban 1500_Continent	IV2SLS_Urban 1500_All
Avexpr	0.519*** (0.102)	0.511*** (0.0930)	0.622*** (0.143)	0.581*** (0.141)
Improvedsjb1500	-0.0238 (0.0212)	-0.0192 (0.0191)	-0.0195 (0.0213)	-0.0190 (0.0204)
Indtime		0.00359* (0.00137)		0.00246 (0.00194)
America			-0.0964 (0.0491)	-0.0506 (0.0596)
Asia			0.0363 (0.0565)	0.0123 (0.0571)
Constant	5.062*** (0.792)	4.637*** (0.752)	4.429*** (0.904)	4.379*** (0.866)
<i>N</i>	38	37	36	36

Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 8.2: IV-2SLS Estimation of Institution_Population Density in 1500 and GDP Per Capita in 1995

	(1)	(2)	(3)	(4)
	IV2SLS_Density 1500_Base	IV2SLS_Density 1500_Independence	IV2SLS_Density 1500_Continent	IV2SLS_Density 1500_All
Avexpr	0.883*** (0.213)	0.669*** (0.154)	1.000* (0.394)	0.832* (0.316)
Improvedlpd1500s	-0.0794 (0.102)	-0.0741 (0.0771)	-0.0658 (0.118)	-0.0685 (0.0965)
Indtime		0.00393* (0.00148)		0.00406 (0.00233)
America			-0.0961 (0.0639)	-0.0264 (0.0625)
Asia			-0.0793 (0.126)	-0.0944 (0.105)
Constant	2.357 (1.420)	3.375** (1.010)	2.200 (2.103)	2.757 (1.681)
<i>N</i>	64	60	59	59

Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$