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Geography, Writing System and History of Ancient Civilizations

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Abstract

We find an undiscovered effect of geography on the choices of writing system in ancient civilizations that in turn drive their courses of historical evolution. The fates of the ancient civilizations were predetermined by the causation spirals generated by the writing system chosen by their ancient ancestors. Understanding the mechanism can enlighten our present political choices that in turn determine the future course of humankind evolution. It can also inspire us about the clue to build an inclusive global society that can integrate the cumulative knowledge, ideas and technology of the diverse speech-communities in the world for a better quality of living for all.

Key words: Geography, Writing System, Historical Evolution

JEL classification: N4, O11, O29, O43, O57.

1. Introduction

The invention of writing enables the leaders and officials of communities to govern public affairs more efficiently. More importantly, writings enable communities to preserve, organize, and expand their civilizations that include their specific collective values, experiences, skills, knowledge and to pass them to future generations.¹ The writing system (WS) in the world can be divided into two categories. The first is the phonographic WS (PWS) that denotes the sounds of speech and is speech-dependent. The second is the logographic WS (LWS) that mainly writes the ideas and things of words which is speech-independent. In the case of a PWS, its dominance is linked to the prosperity of the people who speak the related language. As a result, the survival of a PWS and the embodied civilization depend on the military and economic strengths of the related people relative to their competitors. The natural rise and decline of nations implies that the survival or dominant position of their related speeches, PWS and civilization must be replaced by those of the new dominant nation. In contrast, a speech-independent LWS can outlive the decline of specific tribes/communities/nations as long as the new dominant power adopts the LWS as the key social, economic and political tool for pursuing its own interests. Among its peers, Chinese civilization outlives the other ancient civilizations that include Sumerian, Egypt and Indus Valley. This remarkable resilience and unique characteristics of the civilization can be attributed to its unique speech-independent LWS adopted since ancient times. The LWS serves as a cultural identity building tool among its users which has resulted in the outstanding Chinese economy in terms of population size, wealth, the variety of its produce, degree of commercialization and urbanization, and harmonious relationship between the diverse speech-communities living in the same country. Unfortunately, this LWS is also responsible to the economic and technological stagnation or the ‘Needham puzzle’ due to the resulting exploitative

¹ The widespread use of writing is the precondition for the existence of civilization since it enables communities to preserve, organize, and expand their collective values, knowledge and to pass them to future generation. It also facilitates extensive division of labor and therefore economic advancements. Without writing, a speech-community has only beliefs, norms and traditions, but not civilization.

governments, inferior economic institutions, and related collective values evolved under the logographic environment as concluded in Mo (2004, 2007). These contributions suggest that WS is a very important driving factor to the course of historical evolution. However, a puzzle still remains: why the ancient pictographic WS like those of the Sumerians and ancient Egypt evolved into various PWS that are adopted by most of the countries in the world and why China is the only country in the world using its LWS that can be traced back to thousands of years ago?

In this research, we find an undiscovered effect of geography on the choices of WS in the ancient civilizations that in turn drive their courses of historical evolution. There are many theoretical and empirical studies suggest that geography and location have substantial effects on economic performances through their effects on communication costs, disease burdens, and economic productivity. However, the effect of geography and location on the choice of WS and the associated extensive effects on the course of historical evolution are persistently ignored. After a comparative study on the ancient civilizations, we suggest that one of the most important driving factors on economic development and historical evolution of geography is through its effect the choice of WS that in turn has determined the fate of the ancient civilizations. Understanding the mechanism can enlighten our present political choices that in turn determine the future evolution of humankind communities.

In the next section, we discuss the costs and benefits of the PWS and LWS from the perspective of the leaders/rulers/kings of speech-communities in the ancient civilizations. Section three elaborates the environments that determined the evolution of WS among the ancient civilizations and how the changes had driven their course of historical evolution and survival capabilities. The last section summarizes the themes of our analyses.

2. The Costs and Benefits of the Phonographs and Logographs

All ancient civilizations developed in fertile river valleys favorable for sedentary farming activities. The farmers clustered in permanent sites with fixed shelters and land. This

allowed frequent social and economic exchanges among the people. The environment promoted division of labor, cooperation, and the sharing of expensive infrastructures like irrigation and defense system. The communities therefore enjoyed much faster technological advances and accumulation of production surplus that supported rapid population growth, walled cities and extensive public governance. Public and market demands for communication, exchanges and coordination tool provoked the development, use and spread of a common WS. These river valley farming communities were responsible for the very early sign of civilizations: the use of writing to keep records of public activities, market transactions, amount of wealth, knowledge and experiences which could be effectively passed to their offspring.²

In agricultural economies, land was often a key constraint for improving the wellbeing of a community. Therefore, most speech-communities/tribes were natural competitors because of the non-reproducible nature of land that created a zero-sum game environment among the tribes competing for survival and/or a better living quality. Historically, the relations between nomadic and sedentary people were characterized by numerous conflicts and irrevocable antagonisms. The cause of the conflicts was the natural result of the motivation structure embodied in their geographic and economic environments. The favorable natural environment allowed sedentary farming communities to accumulate increasing amount of wealth over time while nomads roamed from place to place in search for favorable pastures for bare subsistence. Driven by population pressure, poverty, hunger and stringent weather, the poor nomadic herders were forced and/or induced to invade the wealthy

² The formation of ancient civilizations can be considered as a causation spiral that drive the advancements of sedentary farming communities over time: sedentary farming activities → production surplus → walled cities & farming economy → gains from larger population size, frequent interactions, exchanges, public governance and infrastructures → develop, use and spread of writings → advances in knowledge, productivity and technology → expansion of the river valley city-state civilization → gains from economies of scale due to the non-rival nature of WS, knowledge, technology and social interactions → ...

farming communities regularly. The differences in the farming and nomadic living conditions had made them the natural persistent enemies. The farming communities and their leaders were forced to constantly guard against the nomadic invasions. It turned out that the choice of WS was a key strategy in the competition process and the choice had encompassing irreversible effects on the fate of the civilizations.

All of the present WS in the world can be traced back to certain pictographic WS that writes things and ideas directly. Over time, speech-specific phonetic values were introduced to certain pictographic signs incrementally and the signs were used to form speech-dependent words. Some pictographic WS finally evolved into alphabetic WS when the words were made up of phonetic signs only.³ In general, WS in the world can be classified into two groups: the first is PWS that is speech-dependent while the second is LWS that is largely speech-independent. Phonographs are the graphs for sounds while logographs are the graphs for things and ideas. Their differences are sketched in Chart 1 that compares the English phonographic and the Chinese logographic WS.

Chart 1: Speech to Written Messages, Phonographs versus Logographs

<p>PWS:</p> <p>Mother tongue → phonetic values of signs (in English, 26 alphabets) + combination of signs → phonographs for sounds → speech-dependent written messages</p> <p>LWS:</p> <p>Mother tongue → logographs for things and ideas (in Chinese, more than 2,000 logos are required for functional literacy) → speech-independent written messages</p>
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Insert Chart 1 about here

An important benefit of being a member in a community or society is the gains from division of labor, cooperation and exchanges. The members of a speech-tribe are natural

³ For the evolution of WS, please refer to Gelb (1963), Coulmas (1989) and Powell (2009), among many others.

exchange partners. They share identical mother tongue and therefore have no extra costs to acquire the language skills required for social cooperation and market transactions. Writings further reduce the transaction and knowledge transmission costs and therefore further strengthen the wellbeing and prosperity of the community members. In comparing to logographs, phonographs that built on the mother tongue of a speech-community are more effective in strengthening the mutual interdependences and sense of identity among the members. Because the number of signs for denoting sounds is much less than the number of logos needed for denoting things and ideas as demonstrated in Chart 1, PWS is much easier to learn and understand by the community members who have the same mother tongue. It is generally observed that a member in a speech-community normally takes weeks to acquire the functional literacy through PWS for their speech while it takes years for a member to acquire the skill through LWS. It is therefore not surprising that almost all countries are using PWS for communication although all ancient WS are pictographic. From the perspective of facilitating self-tribe (s) communication and consolidation, the net benefits of PWS, $NB_s(PWS)$ is larger than the $NB_s(LWS)$, such that:

$$NB_s(PWS) = [B_s(PWS) - C_s(PWS)] > NB_s(LWS) = [B_s(LWS) - C_s(LWS)] \quad (E1)$$

H
L
H
H

where B and C are the related benefit and cost; H and L, denote high and low respectively.

However, it is unclear why China is the only country in the world still using its logographic WS that can be traced back to thousands of years ago. To answer this question, we analyze the major merits/demerits of the two WS from the perspective of the leaders/rulers/kings in the process of inter-tribes competition for survival.

Chart 2 : Inter-tribes Communication, Phonographs versus Logographs

Phonographic environment: Sending and Receiving Messages among Inter-tribes
A speech message → A phonetic signs + combination of signs + A speech → translations to target receivers
B speech message → B phonetic signs + combination of signs + B speech → translations to target receivers

....
N speech message → N phonetic signs + combination of signs + N speech → translations to target receivers

Logographic environment: Sending and Receiving Messages among Inter-tribes

A speech message →

B speech message → universal logographs → information for all

....
M speech message →

Note: Adapted from Mo (2007, 2008).

Insert Chart 2 about here

As demonstrated in Chart 2, for the communication between different speech-tribes, LWS can be more effective due to its speech-independent in nature that saves the costly translation process between different phonographs. The translation requires knowing the related speech, phonetic values of the signs and words that are specific to the speech-community while recognizing the idea of the logographs is the only criterion for decoding logographic messages. For those inter-tribes that required constant communication and coordination for common interests, using a same LWS was particularly effective for mutual communication and information sharing. Moreover, the larger the number of speech-tribes involved, the higher the saved translation cost for the inter-tribes communication. When the inter-tribes had common enemies, we called them partner-tribes. The effectiveness of LWS in communication among the partner-tribes could substantially raise their coordination power against their common enemies. Additionally, the same writings also promoted their mutual gains from exchanges in goods, technology, experiences, norms and knowledge, and therefore, the common sense of belonging among their members. In order to capture the potential gains, the partner-tribes would be motivated to use a same LWS. In agricultural economies, inter-tribes were natural competitors. Historically, this was particularly true between the wealthy sedentary farmers and the poor nomad herders that regularly invaded their neighboring farming communities. It was not uncommon that the farming partner-tribes (p) united to fight against nomadic invaders. Based on the above discussions, the net benefits of using a LWS among the

partner-tribes, NB_p (LWS), was much larger than that of using speech-dependent PWS from the viewpoint of coordinating efforts to fight against common enemies, such that:

$$NB_p(LWS) = [B_p(LWS) - C_p(LWS)] > NB_p(PWS) = [B_p(PWS) - C_p(PWS)]. \quad (E2)$$

HH L H H

where HH, H and L denote very high, high and low respectively.

However, the ‘openness’ of the LWS to all speech-tribes suggested that it became a deficit when the tribes were competitors and enemies. The speech-dependent PWS allowed a tribe to encrypt messages easily. Through changing the phonetic values of signs and/or their combinations, PWS allowed the leaders of a tribe to transmit information to target receivers only with relatively low costs. Adopting words with speech-specific phonetic signs, they could therefore enjoy the benefits of security from obscurity, of protecting trade secrets, information, technology and national vulnerabilities from their enemy speech-tribes (x). Moreover, in a phonographic environment, inter-tribe communications and exchanges were difficult since learning the speeches of other communities was costly. This alienation effect of PWS would reduce the inter-tribes mobility and exchanges. During inter-tribe competitions, PWS could therefore better consolidate the identical beliefs and common interests specific to the members of a speech-tribe. As a result, from the viewpoint of fighting against enemy-tribes, the openness of LWS became a severe shortcoming such that the net benefit of using a PWS was much higher than that of a LWS, such that:

$$NB_x(PWS) = [B_x(PWS) - C_x(PWS)] > NB_x(LWS) = [B_x(LWS) - C_x(LWS)] \quad (E3)$$

H L L H

Accordingly, the $NB(WS)$ to the leader/ruler/king of a tribe could therefore be decomposed into three parts: the self-tribe, the partner-tribes and the enemy-tribes. Table 1 summarizes the analyses.

Insert Table 1 about here

Table 1: Costs and Benefits of PWS and LWS

WS		Self-Tribe (Communication and Consolidation)	Partner-Tribes (Coordination and Sharing)	Enemy-Tribes (Secrecy Protection)
PWS	Benefits B(PWS)	communication; gains from exchanges; (H, 5)	Gains from exchanges (H,5)	High secrecy protection; tribe member consolidation. (H,5)
	Costs C(PWC)	Low learning and writing costs relative to LWS (L,1)	High translation/communication costs (H,5)	Low encryption/secrecy cost (L,1)
LWS	Benefits B(LWS)	Communication; gains from exchanges; (H,5)	Common sense of identity; gains from exchanges (HH,10)	Low secrecy protection; speech-independent (L,1)
	Costs C(LWS)	High learning and writing costs relative to PWS (H,5)	Low translation/communication costs (L,1)	High encryption/secrecy cost (H,5)

Notes:

1. HH(10) and L (1) etc. denote high and low relative benefit or cost between PWS and LWS. The arbitrary numbers are created to facilitate comparison.
2. The $C_p(LWS)$ between partner-tribes is assumed to be using identical logographs.
3. $B_p(LWS)$ was much larger than $B_p(PWS)$ due to the direct exchanges of ideas through the same LWS. They generated much more effective exchanges and therefore stronger sense of common identity among the members of the partner-tribes.

Moreover, since the information sharing among inter-tribes was non-rival in a speech-independent LWS environment, the larger the number of partner-tribes (m), the larger the net benefits generated by the LWS. Similarly, the benefits of secrecy protections against enemy-tribes were also non-rival, the larger the number of enemy-tribes (n), the larger the benefit generated from using PWS. The following equations summarized the factors determining the net benefits of the two WS from the perspective of the leaders/rulers/kings of a speech-tribe:

Net Benefit of PWS = NB(PWS) =

$$[B_s(PWS) - C_s(PWS)] + m[B_p(PWS) - C_p(PWS)] + [n*B_x(PWS) - C_x(PWS)] \quad (E4.1)$$

H(5)
L(1)
H(5)
H(5)
H(5)
L(1)

Net Benefit of LWS = NB(LWS) =

$$[B_s(LWS) - C_s(LWS)] + m[B_p(LWS) - C_p(LWS)] + [n*B_x(LWS) - C_x(LWS)] \quad (E4.2)$$

H(5)
H(5)
HH(10)
L(1)
L(1)
H(5)

Notes:

1. The numbers associated with the benefits and costs are for illustration only. The key determinant of the NB is the relative size of 'm' and 'n'.
2. It is assumed that the numbers of partner-tribes (m) & enemy-tribes (n) ≥ 1 and each tribe has the same size.

The above analyses suggest that the higher the number of partner-tribes (m), the higher the NB(LWS) and therefore the more likely the farming communities to adopt identical logographs in order to raise their joint capacity for fighting against their common enemy. In reverse, the higher the number of enemy-tribes (n), each speech-tribe would tend to adopt a PWS that was difficult to be decoded by its rivals in order to prevent the leakages of tribal secrets and to consolidate the tribal identity of its members. In the next section, we look into the geographical and political environment of the ancient civilizations that determined the WS policy of their leaders.

3. The Choice of WS and the Fate of Ancient Civilizations

3.1 Natural Environment and the Choice of WS in the Ancient Civilizations

Mesopotamia, Egypt, Indus valley and China are the four ancient civilizations that develop around the same time period. They are known to have developed their respective earliest independent pictographic WS. Although the prehistoric information about the four ancient civilizations is scant, the general political and economic environments encircled their centers of development can still be traced. By comparing the differences, the motivation structure facing their respective rulers related to the WS policy as concluded in Section 2 can be perceived. We can therefore understand the related choices of their rulers that in turn had generated irreversible causation spirals that had driven the historical evolutions and fates of the ancient civilizations.

Except China, all ancient pictographic civilizations had disappeared although some of their heritages and culture were inherited by related civilizations and countries. The coherent written history of China can be found as early as the Shang Dynasty (c. 1700–1046

BC). However, with the rapid advances in archaeological discoveries, the roots of current Chinese civilization can be traced further back for thousands of years. The heritages were constantly reinforced, improved and at the same time, heavily influenced by numerous other cultures in its course of development. In the other ancient pictographic civilizations, some of them endured for over several thousand years but finally disintegrated, collapsed and replaced by succeeding phonographic civilizations. Most of their writings, achievements, experiences and beliefs were forgotten. The divergent historical evolutions and fates of the ancient civilizations post an intriguing question about what are the factors driving the divergences. The story starts with their geography and the resulting policies of their WS.

China is noted as the only walled state and civilization in the world. The climate and the geography of the mountainous northern China separated the continent into the nomad herding economy in the North of the Great Wall and the sedentary farming economy in its South. The Great Wall spanning from the North East to North West of the North China Plain was mostly built along the mountain ranges which served as a major protection for the cores of the Chinese civilization against the nomadic invasions from the North. The ancient Chinese civilization is found to have anchored in the vast and dense sedentary farming communities resided in many various regional centers around the lakes, river valleys and floodplains related to the mighty rivers Yellow and Yangtze. The Great Wall thus symbolizes the existence of the long-lasting common frontier and common interests shared by the vast number of sedentary farming communities in its South. They suggest that the number of partner-tribes (m) residing in the numerous sites related to the rivers Yangtze and Yellow was much larger than the number of enemy-tribes (n) resided in the North of the Great Wall. In order to enhance the partnership identity among the numerous speech-communities and their coordination effectiveness to accomplish the common interest, the initial different pictographic WS among the partner-tribes converged to each other and finally united during

the Chin dynasty (221 - 206 B.C.). The change has been proved to be irreversible despite suffering from many various tests and dynastic cycles afterwards.

Ancient Egypt was one of the oldest civilisations that lasted around 3150 BC to 31 BC. Similar to China, Egypt was another ancient civilization anchored in the sedentary farming communities resided along the rich river valley of Nile. The communities also had a common front in its North-West. Situated at the Northeastern corner of Africa, the ancient Egypt was about the size of the present Arab Republic of Egypt that had an area of about 1,001,450 km². However, the land suitable for sedentary farming activities located in the narrow flat river valley constituted only about 3.5% of the area since the rest of the area was mainly occupied by deserts. In comparing to the other ancient civilizations, Egypt had little records of domestic and international warfare and was found to be the most peaceful ancient civilization. The harmonious environment could be attributed to its relative smallness and homogeneity in economic and political active areas that was likely to have resulted in relative homogeneous speech-communities. That is, with a much smaller 'm' in comparing to that of China. Given the technology in the ancient period, the country had natural boundaries that provided plenty of protection from outsiders. This situation did not change until the Hyksos invaded into Egypt around 1650 BC and ruled the Egyptian land for about a century. The invasion, probably caused by the natural catch-up process in technology and institutions in the neighboring competing states, rendered the Egyptian increasingly aggressive and waged warfare against the Canaanite coalition that occurred along the coastal lands of present Israel, Lebanon and Syria around 1500 BC.. This is the first known international war in ancient Egypt. In coincidence, some 'strange' changes in its WS are documented:

“From the middle of the 3rd millennium but more frequently in the New Kingdom (from *c.* 1539 to *c.* 1075 BCE), hieroglyphic texts are encountered that have a very strange appearance. The absence of familiar word groups and the presence of many signs not found in the canon characterize these texts at first glance as cryptographic, or encoded, writing. This kind of

hieroglyphic writing was probably intended as an eye-catcher, to entice people to seek the pleasure of deciphering it. ... An example of a change in the choice of signs is ... a determinative without phonetic value in the classical script, was later to be read as *f* and was used in lieu of the familiar sign having this phonetic value....”⁴

Given the theory about the choice of WS among tribal rulers as formulated in Section 2, this ‘strange’ phonetic transformation of logo-signs and/or encoded writing can be understood as the need to speed up the phonographic transformation of the pictorial WS for protecting national secrecy against the warring enemies of different speeches that had become stronger over time in the catch-up process. The communication effectiveness among the members of self-tribe that had the same mother tongue would not be severely jeopardized by the phonetic transformation while it generated substantial encryption function against the increasing stronger enemy-tribes. Similarly, this rationale applies to all other related speech-tribes. Once the phonographic international environment was in place, the high transaction cost and alienation effects created a zero-sum game environment among the speech-communities that further reduced the integration possibilities in the region.

In comparing to China and Egypt, the civilizations developed in the Mesopotamia and Indus Valley had no natural boundaries against the invasions of nomad herders around the cores of their civilizations. The wealthy sedentary farming communities in the regions therefore did not share significant common interests as those in China and Egypt. In addition, even within the farming speech-communities, they competed for land, water and other natural resources when their population pressure mounted over time. In such environment, the ‘m’ would be small and ‘n’ tended to be very large to each speech-community in the regions. Based on the theory detailed in Section 2, it is not surprising that the Mesopotamia is known

⁴ Source: www.britannica.com/EBchecked/topic/265021/hieroglyphic-writing/53626/Cryptographic-hieroglyphic-writing. Access date: Oct. 8, 2012.

to be the birthplace of the earliest PWS and at the same time, had historically been plagued with ethnic and religious conflicts among the speech-tribes in the region.

To summarize our discussions, ancient China had a relatively large number of partner-tribes (m) and relatively small number of enemy-tribes (n). The partner-tribes therefore adopted a common LWS. Egypt initially had low ‘m’ and ‘n’ at the same time. The net benefits of using LWS were relatively small in comparing to that of a PWS that was easier to learn and use among the relatively homogeneous residents. In addition, after it was invaded by Hyksos around 1650 BC, the ‘n’ realized by the Egyptian substantially increase that triggered an intentional transformation towards a PWS for encryption purpose. Since Mesopotamia had no common frontier among the related sedentary farming communities, the ‘m’ was small while the ‘n’ was large to each tribe. The regions around Mesopotamia was therefore known to be the birthplace of PWS and under the phonographic environment, suffered from long-lasting ethnic and religious conflicts among the speech-communities. The discussions and related information are summarized in Table 2:

Table 2: Geographic and Political Environments Facing the Four Ancient Civilizations

Ancient Civilizations				
	Egypt	Mesopotamia	Indus Valley	China
Environment & Choice of WS	Low ‘m’, low ‘n’; NB(PWS)>NB(LWS)	Low ‘m’, high ‘n’; NB(PWS) > NB(LWS)	Low ‘m’, high ‘n’; NB(PWS) > NB(LWS)	High ‘m’, low ‘n’; NB(PWS)<NB(LWS)
Nomadic threats	North-West	North, West, South	North, West, East	North
Size of core areas	35,050.75 km ² (1,001,450 x 0.035)	437,072 km ² (size of Iraq)	803,940 km ² (size of Pakistan)	1,919,392 km ² (9,596,960 x 0.2)
Length of related river(s)	River Nile in Egypt: 1,572 km	Tigris: 1,850 km Euphrates: 2,781 km	Indus: 3,180 km	Yellow: 4,670 km Yangtze: 5,470 km
Duration of the pictorial civilization	About 3150 BC to 31 BC.	About 3300 B.C. to about 2400 BC. (the formation of earliest letters)	About 2500BC to 1500 BC	Shang Dynasty (1700 BC–1046 BC) to the present

Notes:

1. Due to the antiquity of the civilizations, almost all data in the table are approximations. For instance, we approximate the length of the river Nile went through the ancient Egypt by taking SE–NW dimension of present Egypt that is about 1,572 km. The size of the core area in ancient Egypt is approximated by the size of present Egypt (1,001,450 sq. km) times 0.035 that is the area suitable for sedentary farming activities in the narrow valley of river Nile. The size of the ancient China proper is approximated by the size of present China (9,596,960 sq. km) times 0.2, etc..
2. Directions of nomadic threats are concluded from the topography of the neighboring area that can support only nomadic herding activities rather than sedentary farming activities.

Insert Table 2 about here

3.2 WS and the Fate of the Ancient Civilizations

The natural rise and decline of powers among nations due to cumulative distortions in organizations and the catch-up mechanisms in the lagged nations imply that the dominance of a civilization cannot rely on military and coercive powers.⁵ A sustained civilization must be able to enhance the common interests of the speech-communities involved. Among the ancient civilizations, only the civilization developed in China enjoys remarkable continuity, rejuvenating power and with sufficient production surplus that support the largest population size in the world. The civilization proved to be remarkable in absorbing and assimilating nomad invaders while preserving their own sense of identity and advancing their traditional elements. Although each dynasty in history contributed in bringing new elements into the ancient civilization, fundamental themes and patterns that could be traced to pre-historic era remained intact. What has made the civilization unique and special in humankind history? In this section, we try to analyze the effects of WS on the historical development of the ancient civilizations.

There are two important anchorages to all civilizations. The first is the survival of the people who share similar memories, collective beliefs, group identity and use the same

⁵ Olson (1971), Mo (2011).

WS. This depends on the military and economic strengths of the related civilization relative to their enemies. The second is the survival of the related WS itself since WS is the key carrier of civilization that includes specific memories, experiences, collective values, knowledge and technology.

The size of economic and political area in ancient China was about 50 times of those in ancient Egypt. Relative to the peers, Chinese civilization was anchored on dense and strong farming communities with common enemy while the others suffered from relatively weak farming communities and/or being encircled by nomad herders. Besides the effect on the choice of different WS as mentioned above, the diverse and vast hinterland enjoyed by Chinese civilization had substantially raised its capability to survive against natural disasters and foreign invasions in comparing to its peers. However, even after the construction of the Great Wall that spans from the North East to North West of the North China Plain, the natural mechanism of the rise and decline of nations implies that ancient China could not get away from the nomadic invasions and conquests. Throughout the history, the nomads moved almost continuously into the core areas of Chinese civilization from its North and West. In many historical episodes, China proper was governed by nomad invaders. However, after the nomad invaders settled among the vast Chinese farming communities, their interests became aligned with the existing communities and faced the common nomadic enemies in their North. Moreover, according to Chart 2, the LWS is much more effective in reducing transaction costs between speech-communities than PWS. The LWS allowed all users in diverse speech-communities to express and think about things and to exchange their perception and knowledge about society and nature through the writings and related literatures that are independent to specific speeches. The ever expanding and incorporation of the wordings and ideas from thousands of speeches in the logographic civilization had continuously enriched the content and expressiveness of the LWS and the thought horizon of its users. This openness and integrative power under the logographic environment had raised the soft power of the

civilization that attracted neighboring countries to join the logo communities. They were impressed by the incorporative attitudes, advanced technology, prosperity and wanted to attain the benefits of being a part of the civilization and the related vast economy. In the process, the logo-civilization developed initially by the alliances of necessity among the speech-tribes, triggered a causation spiral that had supported its sustaining advances by unceasing incorporation of advance elements from various speech-communities and ironically, from its conquerors also. In most cases, the expansion of the civilization was not derived from the hard power of military outcome and economic might, but through the integrative power of the LWS that allowed diverse speech communities to live in harmony and to gain substantially from beneficial exchanges. The well-documented examples include Manchuria, and in certain historical episodes, Korea and Japan. The expansions in turn generated increasing product diversity, advances in the wealth of knowledge and technology available to the existing users and induced more users over time. To conclude, the adoption of a common LWS among the partner-tribes in ancient China had generated a causation spiral of integration and ever-expanding economic and political size of the logographic civilization that had enabled it to survive and prosper for more than 4,000 years up to the present, far longer than any other civilizations in the world.⁶ The conquests by nomad invaders had reinvigorated and enriched the logo-civilization instead of eliminating it as those happened in Mesopotamia, ancient Egypt and Indus Valley. The divergent historical outcomes were the results of the different causation spiral generated by the different WS.

In contrast, PWS tended to shut the speech-communities off the rest of the world and developed specific speech-dependent religions, collective values, traditions and knowledge. The tendency was strengthened when the leaders of small speech-communities deliberately designed a PWS of abnormal difficulties to learn in order to consolidate tribal

⁶ The causality spiral can be understood schematically as follows: Integrative power of LWS → ever-expanding political and economic size of the civilization, number of users and 'm' increase over time → content enrichments in the LWS and expansion in economic opportunities of the users → more powerful against nomadic invasions and induce more speech communities to join the logo-civilization →....

identity of the members and therefore, their political powers. The alienation tendency of PWS generated a zero-sum game environment that resulted in continuous disintegration, fierce competitions and antagonisms among speech-communities. In this environment, ancient superior military and economic powers came and gone and so did the related dominant PWS, collective values and knowledge specific to related speech-civilization.⁷ Even though in some historical episodes, some brilliant leaders/rulers/kings in the regions recognized the associated benefits of LWS and intended to build one, it became almost impossible to develop an effective LWS since the original logic and structure of ancient pictographs were forgotten over time during the brutal struggles among the speech-communities in the phonographic environment.

4. Conclusion

Our study suggests that the evolution of WS reflected the deliberate political choice among the ancient civilizations under the different motivation structures generated by the specific geographies and locations they had resided. The choices had generated causation spirals that resulted in irreversible changes in WS, national identity, collective values and inter-community relationship. They were responsible to the great divergences between the logographic and phonographic civilizations. The fates of the ancient civilizations were predetermined by the causation spirals generated by the WS chosen by their ancient ancestors. In this paper, we contribute to introduce an undiscovered effect of geography on the choice of WS that in turn drives the diverge courses of development in the ancient civilizations. Understanding the mechanism can enlighten our present political choices that in turn determine the course of our future development. It can also inspire us about the clue to build an inclusive global society that can integrate the cumulative knowledge, ideas and technology

⁷ In a phonographic environment, after a civilization was conquered by other speech-tribes, it normally left scant effects on their offspring civilizations. Most of the specific elements in the conquered civilization anchored in its WS were lost. The succeeding dynasties normally deliberately destroy the original WS, books, structures and traditions of the conquered nations in order to assimilate the defeated people by eliminating their memories and cultural identity.

of the diverse speech-communities in the world for a better quality of living for all. The inclusive society will treat diversities as an asset rather than the cause of social and political antagonisms.

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