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Society-nature-technology (SNT) nexus: Institutional causes and cures of national morbidities

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ABSTRACT

This article explores a nexus between society, nature and technology (SNT) in the context of a biomedical problem-solution through innovation project for a new product development in the biopharmaceutical sector. The nexus implies that social intervention is an antecedent to and consequence of nature as a type of morbidity. The central proposition is that national morbidities are partially resulting of national institutions such as policy and culture, and the national institutions partially constitute the response to through industrialisation processes and cultural habits. Based on the data from China and India as two comparable socio-culture contexts, we draw on six types of national morbidities: diabetes, infections, cancer, hepatitis, respiratory dysfunction and hypertension. An analysis shows that diabetes and infectious diseases projects exist more in India; cancer, hepatitis and hypertension projects exist more in China; and contrary to prediction, respiratory dysfunction project appears more in India than China. There are some statistical differences between the North and South regions. The discussion explains the SNT nexus in a broader context suggests two types of interventions: preventive and curing. The preventive intervention comes before nature (morbidity), and the curing intervention occurs after the formation of morbidity. We suggest that preventive institutional intervention for education can be more effective than curing intervention. The prevention mechanism induces awareness; the curing mechanism induces treatment solutions. Our argument supports the social development as much as industrialisation, and not pure industrialisation alone.

1. Introduction

This study integrates three related streams of ideas on the social–nature coevolution. One stream suggests that national institutions intervene in biological morbidity and predict its change in the cycle. The industrial policies and cultural habits leading to environmental changes are in this stream. The second stream suggests that nature shapes the social–technological response. For example, the industrial policy in the biomedical sector and cultural responses that allow research and development in the process. National morbidity, such as cancer as an instance of nature, has roots in social institutions and attracts social intervention in the form of technological solutions (Spilg et al., 2012). The third stream represents the national institution as a cause and consequence of the changes in the natural phenomenon (Malik, 2017a, 2017b). Appendix A depicts these links at a coevolutionary level in an abstract idea. We call this integrated theme the society–nature–technology (SNT) nexus. This triadic relationship in the framework projects cultural motion as a predictor, national morbidity as its results, and social–technological response as the cultural evolution in the triad in integration (Dawkins, 1989).

The SN (society–nature) dyad predicts that human action alters morbidity in coevolution. Global warming through CO_2 emissions captures the SN relationship. Industrialisation causes pollution–lead national morbidities (Lancet, 2017). Similarly, tobacco smoking, as a memetic social habit, leads to cancer morbidities (Czerwinski et al., 2007; de Walque, 2010; Hirayama, 1981). Excessive raw sugar consumption, as a cultural and ritual practice, leads to diabetes (Bhattacharya, 2015; King et al., 1998; Nicolaisen, 2009). In addition to cultural diets, the defecation problem results from national institutions. The lack of toilets and sanitation leads to bacterial infections. By contrast, the NT (nature–technology) dyad takes morbidity as a given and addresses industrialisation as a sociotechnological response. For instance, universities and biotechnology companies search for treatments for these biological anomalies. The social intervention in childbirth also relates to the NT perspective (Mansfield, 2008). The third logical link completes the evolution cycle by linking 'S' to pre-morbidity intervention and 'T' to post-morbidity intervention. The pre-morbidity intervention occurs because of the collective subconscious and has a

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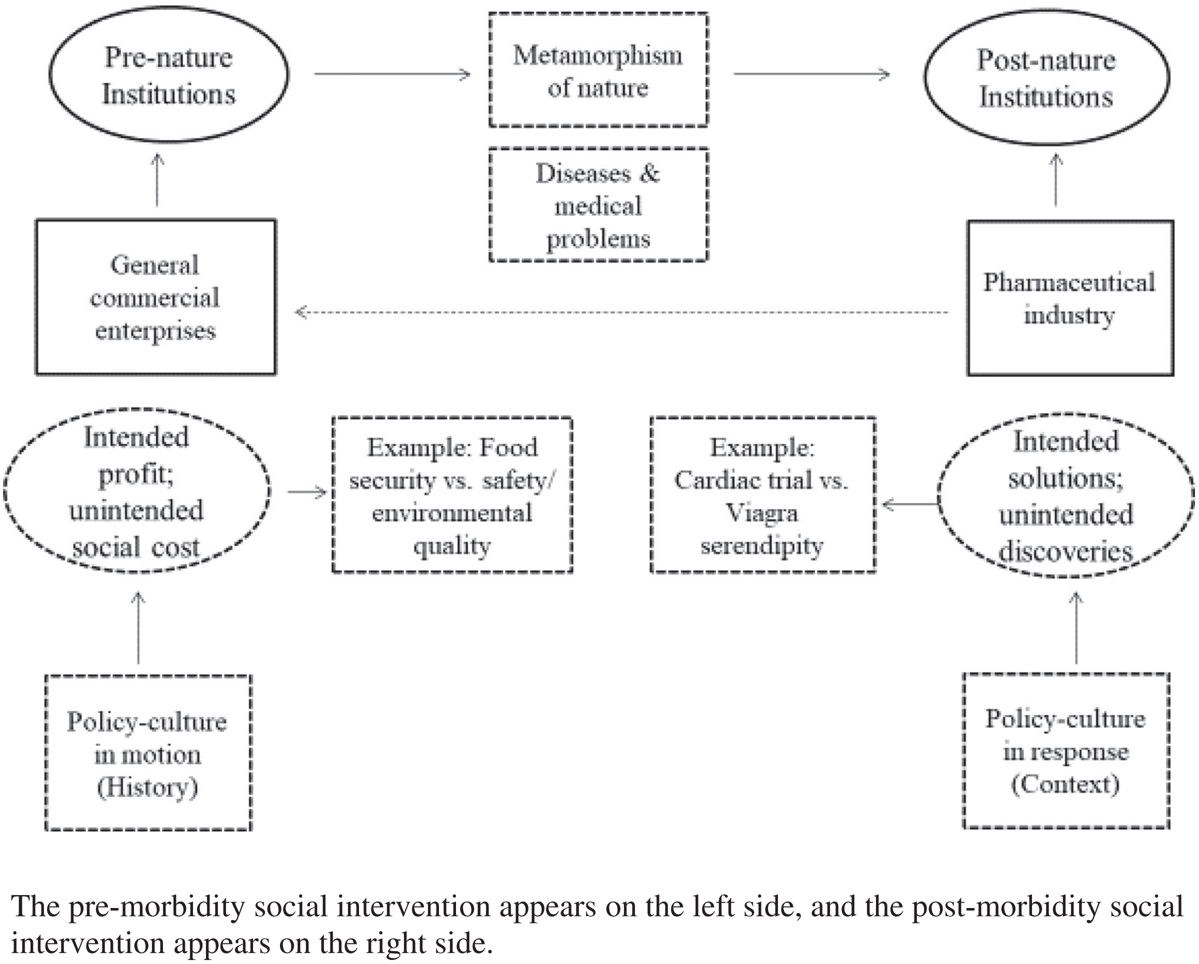

Fig. 1. Social intervention in pre- and post- metamorphism of morbidity.
The pre-morbidity social intervention appears on the left side, and the post-morbidity social intervention appears on the right side.

contextual orientation, namely, meaning and action (Weber, 1978). The post-morbidity intervention occurs because of the strategic technological response in the SNT nexus. Appendix A elaborates on these three links and their interactions.

Integrating these three links into the SNT nexus, we can explain a full cycle of institutional coevolution with nature. Intervening policies can mitigate the adverse effects of the motion of the national culture and support its positive solutions to morbidities. Empirically, we address this phenomenon in a Sino–India comparison in the biopharmaceutical sector. The developed structure of this sector postulates a standardised context to link the three elements of the SNT in a plausible manner to the evolutionary cycle (Fig. 1).

2. Framework

Two conceptual terms support the link between society and morbidities for the coevolutionary argument. One concept refers to constitutive reality and the other to constructive reality. The constituted reality assumes a context-free truth, which stands independent of social interventions. According to the constitutive logic, national morbidities, such as diabetes, cancer, and hepatitis, metamorphise free from the effects of the national cultural context. This view of context-independent morbidities represents the external truth. By contrast, the constructive view of reality assumes a context-dependent truth. According to the constructive view, the social context influences morbidity as its cause and response. For this reason, some countries have one type of disease more than others. A coevolutionary theorist explains that the biology and culture coevolve (Dawkins, 1989). Biology is the constitutive part; national culture is the constructive part. Similarly, the actors and natural system affect each other (Giddens, 1984). The actor carries the cultural influence for the constructive part; the natural system carries the constitutive part. Thus, the coevolution results from the intervention before and after the natural phenomenon in the SNT framework.

The cultural intervention before and after the natural phenomenon occurs in subtle and coevolutionary ways: intended and unintended. The intended intervention refers to policy programmes and relates to former rules, regulations, and policy matters. The unintended intervention results from the intended policy and programmes and refers to the variation of the social context that induces a change through interpretative meanings for the practice of formal policies (Douglas, 1986; Giddens, 1984; Levi-Strauss, 1966; Weick, 1979). An example from the clinical trial clarifies the formal policy and contextualised practices. The clinical trial policy standard requires “autonomy”, which necessitates the informed consent from volunteers under free-choice conditions (National-Commission, 1979); the national practice of the informed consent differs. National definitions of autonomy differ because culture, language, education, economic, social, legal, and other contexts differ. These autonomies occur on and below the surface of the social system. The result is the intended and unintended social interventions when policy and practice meet.

These two conceptual terms (constitutive and constructive) and social interventions to nature (intended and unintended) formulate the SNT nexus framework—developed in detail in the following sections. Although both stages of intervention, namely, pre- and post-nature, describe the social intervention, for clarity, we use distinctive terms. The pre-nature intervention refers to society (S), and the post-nature intervention refers to technology (T).

2.1. Social–nature–technology nexus

The clarity of the proposed SNT framework increases by combining Fig. 1 with Appendix A. Appendix A presents an abstract denotation of the three parts of the SNT nexus. Fig. 1 further elaborates on these parts by deconstructing them. These micromechanisms in Fig. 1 constitute the macrocycle in Appendix A. The argument that builds on these relationships between Appendix A and its explanation in Fig. 1 support the social mechanisms in the social (Freedman, 1991; Stinchcombe, 1965) and biological co-evolutions (Crick, 1989). The social coevolution implies the interactional changes within social mechanisms; the biological evolution implies interactional changes within natural mechanisms. The cross-juxtaposition between the social and biological mechanisms (Dawkins, 1989) comes closer to the SNT framework proposed in this study, in which nature identifies morbidities.

The left side in Fig. 1 portrays the pre-morbidity stage in the presumed evolutionary cycle of the SNT nexus. The intervention at the pre-morbidity stage in the SNT nexus alludes to social interventions, such as formal policy and culture. The cultural intervention stems from intended and unintended cultural practices. Because the intended policy and unintended cultural practices affect and reflect each other, coevolutionary cycles occur at the social system level, biological system level, and sociobiological system level. At a broader level, the coevolution between culture and nature becomes ubiquitous (Dawkins, 1989), for instance, the industrialisation policies define the intended intervention in the social–nature coevolution. This intended policy has the unintended practice of creating a high social cost. The environmental degradation, socioeconomic inequalities, and health issues result in unintended costs (Deaton, 2002; Sen, 1999). Because national policy, discourse, and behaviour differ, they contribute to variegated intended and unintended national costs (Anand and Sen, 2000).

Similar to pre-morbidity policy and cultural practice in the coevolutionary process is the post-morbidity cultural policies' response to nature (Giddens, 1984). The post-morbidity intervention has intended connotations as a response to national morbidities. First, the intended intervention solves an intellectual problem such as the generation of new knowledge. Second, it solves a societal problem such as a medical treatment for the morbidity. Third, it solves an economic problem such as growth. Fourth, it solves business problems of industrial firms such as new product development. These intended responses to national morbidities appear in the right side of the evolutionary cycle in Fig. 1. The post-morbidity intervention rests on the following assumption: whenever new national morbidities occur, the biopharmaceutical sector actively responds to this strategic purpose. A business firm will invest USD 1 billion in a typical clinical trial when expecting a blockbuster product in the market.

However, similar to the pre-morbidity intervention, the post-morbidity intervention reflects the national culture in the coevolution of the policies of the government and practice of firms. The literature shows that entrepreneurial activity in the United Kingdom (UK) differs from that in Sweden and Germany (Casper and Whitley, 2004). One difference alludes to the interinstitutional policies and practice and the other refers to intra-institutional policies and practices. The inter-institutional differences in policies and practices suit the Sino–India differences, for instance, the global technical and ethical standards for the clinical trial originate from the Western industrial economies. However, these global standards translate into different inter-institutional and intra-institutional policies and practices. Although both economies attract foreign and domestic projects, they have different technological and sectoral trajectories. China has a comparative advantage over India in the exploration of science and discovery of new knowledge; India has a comparative advantage in the exploitation of the commercialisation of generic medicine. Therefore, the post-morbidity industrial response follows social institutions.

2.2. Hypotheses

Using the national morbidity as an instance of nature (N) in the framework, we review the industrial evidence on six national morbidities to support the coevolutionary framework of the SNT nexus in the Sino–India comparison. We chose these national morbidities because they have roots in cultural policies and practices as well as influence the industrial response. Furthermore, these morbidities exist in both countries (China and India), reflecting inter-institutional and intra-institutional variation. The respective hypotheses proposed for the empirical analysis follow these national morbidities: (i) diabetes, (ii) infections, (iii) cancer, (iv) respiratory, (v) liver/hepatitis, and (vi) hypertension.

Diabetes morbidity dominates in India, compared with China, because of the pre-morbidity cultural intervention and post-morbidity technological intervention. Regarding the pre-morbidity intervention, India's population consumes an excessive amount of sugar for social symbolic and substantive reasons (Diamond, 2011). The consumption of white sugar, jaggery, and other raw sugars occur with high frequency and amount in the Indian culture. The Indian diet primarily consists of low-fibre and refined carbohydrates, and these ingredients are possibly linked to insulin resistance factors (Bhattacharya, 2015). India consumes more sugar per person than any other nation in the world (Lam et al., 2013). The World Health Organization recommends a maximum daily sugar consumption of 26 g (6 teaspoons). China and India differ on these pre-morbidity causes of diabetes. Appendix B indicates that on average Indian and Chinese people consume 58 g (10 times higher) and 33 g (6 times higher) of sugar on average, respectively (Lam et al., 2013). The Chinese rely more on indirect sources such as xylitol and monk fruit. Calories from natural sources have less harmful effects on diabetes than sugary additives (Lustig et al., 2012). Although the industrialisation contributes to the emerging obesity in China (Wang et al., 2007), India leads in this social and cultural intervention into nature (USDA, 2015).

Heavy sugar consumption leads to national morbidities. For instance, “India's diabetes time bomb” (Shetty, 2012) suggests that the cultural practice contributes to India's raw sugar consumption, and national culture plays a significant role in the Indian diabetes explosion (Singhal et al., 2010). The excessive consumption of sugar in India results in diabetes at a critical level (Lustig et al., 2012). If diabetes has roots in culturally induced practices at the pre-morbidity stage, then the post-morbidity industrial response to diabetes in India will exceed that in China.

Hypothesis 1. India will have more innovation projects on diabetes than China.

Infectious morbidity dominates in India, compared with China, because of the pre-morbidity cultural intervention that either causes infections or ignores them and post-morbidity industrial response. The infectious diseases in India have cultural causes that enhance the national morbidity or ignore it. The journal *Nature* found 335 types of infectious diseases between 1940 and 2004 worldwide. Bacteria (Rickettsia) cause the greatest number of infectious diseases (54.3%) in India. Similarly, the spread of the chikungunya dengue virus in 1965, cholera in 1992, plague in 1994, the Nipah virus from 2001 to 2008, and acute encephalitis syndrome in 2012 contributed to infectious disease through the sociocultural practices in India. At the social policy level, extreme poverty, lack of education (Deaton, 2013; Drèze and Sen, 2013), and inadequate sanitation promote the proliferation of bacteria and spread of infectious diseases in India (Jones et al., 2008).

The evidence indicates that despite India's rapid economic growth, it lacks policies for the education and cultural changes required to increase its sanitary and hygienic conditions and reduce infectious diseases. Approximately 47% of Indians must use open defecation, compared with < 1% Chinese (UN, 2015). India has inadequate sanitary facilities and indoor toilets (CSMonitor, 2014). Open defecation positively correlates with infectious diseases (UN, 2015), and the lack of sanitary conditions is far below a minimal standard (Deaton, 2013; Sen, 1985). Research shows that this phenomenon is partially caused by cultural and religious overtones. Rituals and superstitions have structural influences on public awareness (Sen, 2003). For instance, a portion of the population consumes cow's urine and dung for religious and medicinal reasons. Bacteria in infested rivers could be another contributor to infectious diseases in India. In addition to defecation and infested rivers, India has high rates of viral infections such as HIV AIDs. In 2015, in India, there were 2.1 million cases of HIV AIDS compared with 501,000 in China (UNAIDS, 2015). Therefore, the policies and practices predict bacterial and HIV AIDs-related morbidities in India.

Another social contributor to infectious disease in India comes from the negligence of policies and regulations for child protection. India is fifth in the ranking of child rape cases, and these incidents increased approximately 336% between 2001 and 2011 (ACHR, 2013). China has performed far better than India in child protection policy and practice. For instance, China's government has improved child welfare (Deaton, 2013). Because of China's one-child policy, 2 to 3 people take care of the child's well-being. The data from China might be incomplete, but the magnitude of India's problem highlights the subtle issues and misplaced national policies and social motions (Sen, 1999).

Appendix B presents the evidence that India leads in infectious diseases, compared with China, because of pre-morbidity cultural causes and post-morbidity responses. In support of the pre-morbidity cause, the estimate from the United States' Central Intelligence Agency demonstrates that India and China pose a ‘very high risk’ and “intermediate” risk of infectious diseases for visitors, respectively (CIA, 2016). In support of post-morbidity industrial response, a study by Rezaie et al. (2012) shows that 17 (59%) vaccines developed in the world correspond to infectious diseases in India, whereas 10 (34%) vaccines developed in the world correspond to infectious diseases in China. At the policy level, Sen (1999) consistently demonstrated that the healthcare and education for awareness was greater in China than India (Sen, 1998). If the pre-morbidity institutional causes place India ahead of China in infectious morbidities (Deaton, 2013; Drèze and Sen, 2013; Sen, 2010), and post-morbidity industrial vaccines are used India more than China, then we propose:

Hypothesis 2. India will have more innovation projects on infectious disease than in China.

Hepatitis or liver morbidity dominates in China, compared with India, because of the pre-morbidity cultural intervention and post-morbidity industrial response. Hepatitis causes inflammation of the liver and has infectious and non-infectious sources. Infectious sources of hepatitis relate to viral, fungal, and parasitic organisms. Once formed, they are transferred through close, interpersonal encounters. The non-infectious sources of hepatitis relate to alcoholism and certain drugs, and the industrial chemicals in China's environment further compounds hepatitis morbidity. According to the literature, China's population has very high rates of hepatitis (Nelson et al., 2011). Roche, a Swiss pharmaceutical company, estimates that approximately 350 million people worldwide have a chronic hepatitis B infection and 180 million have hepatitis C. Among them, 100 million people with B (51%) and 8 million with C (8%) live in China (Roche, 2014). In India, approximately 40 million people are infected with hepatitis (TheEconomicTimes, 2014). The evidence in Appendix B places China much higher than India in number of hepatitis cases because of policy and cultural practices. Therefore, their chronic exposure to alcohol, certain drugs, toxic chemicals, and pesticides in agricultural productivity adversely affect the autoimmune system.

Cultural habits such as liquor consumption and policy programmes such as industrial activity predict China's strong lead in hepatitis formation. For instance, Chinese culture suggests that liquor consumption strengthens friendship, contributes to business deals, supports social ceremonies, and highlights achievements. Notably, the lower income strata consume homemade or poorly processed sources of liquor and the contents of these beverages and procedures to make them consist of multiple toxins. Toxins harm the liver. In addition to social habits that harm the liver internally, the industrial chemicals associated with industrial activities harm the liver externally—the industrial toxins enter the food chain (*Lancet*, 2009). Therefore, based on the evidence of pre-morbidity causes and post-morbidity industrial response to hepatitis in China, we propose:

Hypothesis 3. China will have more innovation projects on hepatitis than India.

Cancer morbidity dominates in China, compared with India, because of the pre-morbidity cultural practices and post-morbidity industrial attention. China leads in cancer-related disease pre-morbidity sociocultural interventions. Firstly, the industrialised context of China predicts its pre-morbidity practices. The chemical spill-over from industrial waste into human life contributes to cancer morbidities. Scientists at the Lung Cancer Treatment Centre at Beijing's Capital Medical University explain that incidences of cancer directly relate to the exposure to air pollution and occupational exposure to carcinogens (Li, 2014). Secondly, cigarette smoking contributes to lung cancer in China. Cigarette smoking is fashionable and has diffused in China without barriers. The profound diffusion of smoking has reached university administrators, academics, admin staff, and students who freely smoke in offices at university campuses, student dormitories, and classroom corridors. In 2015, the Chinese Centre for Disease Control and Prevention estimated that 51.1% of China's males smoke, and 81% of those smokers know that smoking causes cancer. On the global stage, Appendix B shows that China leads in smoking habits among medium-to low-income countries (Pampel, 2007).

China leads India in smoking habits. The scientific evidence shows that passive and active smoking contributes to cancer morbidities (Brandt, 2007; Glantz, 2008). The US Surgeon General confirmed this link between smoking and cancer in the early 1960s. Subsequently, Japanese researchers established that passive smoking causes cancer, and confirmed that smokers' wives were at risk of developing lung cancer (Hirayama, 1981). Additional studies provide supporting evidence that passive smoking contributes to cancer morbidities (Doll, 1998). If the pre-morbidity cultural habits explain national trends, and post-morbidity attention needs solutions to cancer disease, then we propose:

Hypothesis 4. China will have more innovation projects on cancer technology than in India.

China also leads in respiratory morbidities, compared with India, because the causes associated with cancer also contribute to respiratory disease. One cause of respiratory malfunction comes from the air pollution, and air pollution in China outweighs that in India. Citing evidence from multiple research studies, the Daily Telegraph in the UK highlights the danger of respiratory diseases for millions of Chinese because of their country's air pollution (TheTelegraph, 2014). A 2017 study confirms that China has the highest burden of pollution-driven morbidities, followed by India (Lancet, 2017). In addition to air pollution, tobacco smoking in China causes lung-related diseases. Appendix B presents the link between smoking and respiratory diseases such as asthma. Because China leads in industrial pollution, degradation of the environment, low food safety, and smoking, its culture and policies predict that:

Hypothesis 5. China will have more innovation projects on respiratory illnesses than India.

The prediction that China will have more hypertension morbidity projects than India is because of cultural and biological evolution (Dawkins, 1989). Hypertension (high blood pressure) morbidity has been steadily increasing in China, and one estimate shows a 39% increase (Wang et al., 2014). Another study explains that China has a clear lead in hypertension-driven morbidities (Prince et al., 2012) for several reasons. First, the desire for economic growth in industrial policies has degraded the environment, food safety, and environmental conditions. Sen and Deaton, two Noble Laureates, have consistently argued that the negative externalites of industrialisation for economic growth include the inadvertent costs of environmental quality, food safety, and health (Anand and Sen, 2000; Deaton, 2013). Second, the social hierarchy contributes to anxiety and stress, leading to hypertension morbidities.

According to the literature, social hierarchy is a causal link of hypertension in a society. Low-ranking primates are more likely to develop stress and physical diseases than high-ranking primates (Virgin and Sapolsky, 1997). Sir Michael Marmot and his colleagues at the University College London studied 28,000 people for 30 years and conclude that social hierarchy highly contributes to high blood pressure diseases (Ferrie, 2004; Marmot, 1997; Wilkinson and Marmot, 2003). In a comparison of the social structures of China and India, the hierarchy at workplaces in China was more diffused in type and size than in India. Regarding type, the Chinese vertical hierarchy permeates every segment of life, for example, home, offices, university, and rituals. In India, the social hierarchy permeates, for example, social classes, religions, regions. Regarding size, low literacy and high exclusion from the workforce reduces the number of people in the hierarchical effects. In China, high literacy and inclusion in the workforce increase the size of the vertical structure. Moreover, long-established hierarchical distance in the Chinese culture places China in the lead. The power distance in China (80) exceeds that in India (77) (Hofstede, 2001). By contrast, individual freedoms in China (20/100) lag behind India (48/100). Therefore, we predict:

Hypothesis 6. China will have more innovation projects on hypertension technology than in India.

Similar to the interinstitutional contextual role in the pre- and post-morbidity interventions, the inter-institutional context supports the main proposition. We consider this intra-institutional difference in the north–south differences in China and India. Instead of comparing countries, we compare the north with the south in China and India. Thus, inter-regional cultural comparison captures the differences in morbidities and industrial responses.

In China, the “bread culture” of the north differs from the “rice culture” of south (Talhelm et al., 2014), which implies that the post-morbidity response will be different between the north and south. The expected post-morbidity response and pre-morbidity cultural habits will be different. Thus, industrial activity such as clinical trials will be different in the north and south of China.

In India, the south differs from the north in literacy, education, life expectancy, and freedom (Sen, 1998). For instance, the southern State of Kerala draws attention to this particular north–south divide (Drèze and Sen, 2013). Because diverse cultures shape inter-regional behavioural differences, and behavioural differences predict regional morbidity patterns, the north–south divide will appear in the statistical analysis of innovation projects in the region. Because the intra-institutional (i.e. regional) differences argument postulates supplementary support for the main argument, we use a single hypothesis to conclude. Thus:

Hypothesis 7. Innovation projects in the North will be significantly different from southern China and India.

3. Methods

3.1. Setting

China and India, the two largest countries in population and fastest growing economies have attracted clinical trial projects because of the national morbidities specifics to these economies (Thiers et al., 2008). The main sponsors of clinical trial projects come from the OECD economies (Salter et al., 2007). Our analysis focuses on the differences between the two economies in the SNT framework. As noted earlier, the letter ‘T' in the SNT nexus stands for the clinical trial project. Such a project has distinctive characteristics. First, the clinical trial projects respond to the national morbidity of a specific population (National-Commission, 1979). Second, the clinical trial needs proximity with the market. Third, economic motives (low cost, talent pool, infrastructure, and volunteers) influence the clinical trial projects entry into the economy. Among these, the prevalence of morbidity implies that the technological response will be compatible with it. Indeed, industrial policy and cultural habits predict the morbidity and the technological response, making China and India suitable for the research.

3.2. Sample

The data consist of the population of clinical trial projects in China and India. These projects exist in the database of the NIH (National Institute of Health). Those projects in the NIH database enter in the list for the FDA (Food and Drug Administration) for approval. The NIH database excludes minor projects. Based on the NIH database, our sample has 17,367 clinical trials in China; 7586 projects in India. Table 1 lists the cities hosting these clinical trial projects. In China, the Yangtze River divides the North from the South; in India, the social development of the South separates from the Centre, West and North (Sen, 1998).

3.3. Variables

3.3.1. Dependent variables

The main dependent variable consists of the binary: China (1) versus India (0). In the *t*-test analysis, the China–India binary becomes the independent variable, and the multivariate morbidities become the dependent variables it. In the North–South regional comparison between the two countries, the six morbidities become dependent variables of the North–South binary.

3.3.2. Independent variables

The six morbidities stand for the independent variables. These morbidities show clear links to national policy and cultural norms; they occur in higher frequencies; the difference between the two economies; they offer premorbidity and post-morbidity links to cultural practices.

- Diabetes refers to abnormal glucose level in the bloodstream
- Infectious morbidities (Tuberculosis, Leprosy, Vector-borne, Water-borne, Zoonotic, and vaccine prevention)
- Respiratory (lung/asthma) problems originate from inhaling unhealthy air
- Hepatitis relates to the liver morbidity
- Cancer relates to non-communicable, blood-related morbidities.
- Hypertension refers to blood pressure animalities

3.3.3. Default categories

The default category holds the list of less frequent morbidities in Table 2.

3.3.4. Control variables

(a) The number of participants—patients and volunteers; (b) the number of sponsors of the clinical trial; (c) the number of financiers. We

Table 1
Distribution of trials in Chinese and India cities.

China	Size	%	Region	India	Size	%	Region
Beijing	2771	16.0%	N	Delhi	859	11.3%	N
Shanghai	2281	13.1%	S	Bangalore	826	10.9%	S
Guangzhou	1806	10.4%	S	Mumbai	798	10.5%	N
Nanjing	1002	5.8%	N	Pune	675	8.9%	N
Hangzhou	807	4.6%	S	Hyderabad	624	8.2%	S
Xian	744	4.3%	N	Chennai	517	6.8%	S
Wuhan	712	4.1%	N	Ahmedabad	502	6.6%	N
Chengdu	697	4.0%	S	Jaipur	324	4.3%	N
Tianjin	641	3.7%	N	Lucknow	259	3.4%	N
Chongqing	554	3.2%	S	Nagpur	255	3.4%	N
Changsha	513	3.0%	S	Kolkata	254	3.3%	N
Shenyang	474	2.7%	N	Coimbatore	184	2.4%	S
Jinan	450	2.6%	N	Chandigarh	175	2.3%	N
Changchun	382	2.2%	N	Ludhiana	173	2.3%	N
Fuzhou	322	1.9%	N	Madurai	147	1.9%	S
Harbin	271	1.6%	N	Indore	143	1.9%	N
Shijiazhuang	268	1.5%	N	Nashik	114	1.5%	N
Suzhou	239	1.4%	N	Visakhapatnam	83	1.1%	S
Zhengzhou	231	1.3%	N	Vadodara	81	1.1%	N
Nanning	227	1.3%	S	Aurangabad	69	0.9%	N
Qingdao	195	1.1%	N	Varanasi	55	0.7%	N
Hefei	187	1.1%	N	Bhopal	55	0.7%	N
Nanchang	184	1.1%	S	Surat	54	0.7%	N
Kunming	178	1.0%	S	Vijayawada	53	0.7%	S
Dalian	163	0.9%	N	Kanpur	47	0.6%	N
Taiyuan	158	0.9%	N	Patna	38	0.5%	N
Shenzhen	136	0.8%	S	Navi Mumbai	38	0.5%	N
Lanzhou	97	0.6%	N	Thiruvananthapuram	32	0.4%	S
Wuxi	92	0.5%	N	Ghaziabad	23	0.3%	N
Xiamen	83	0.5%	S	Thane	21	0.3%	N
Xuzhou	76	0.4%	N	Rajkot	21	0.3%	N
Urumqi	74	0.4%	N	Guwahati	19	0.3%	N
Guiyang	71	0.4%	S	Amritsar	12	0.2%	N
Yinchuan	67	0.4%	N	Faridabad	11	0.1%	N
Ningxia	55	0.3%	N	Srinagar	8	0.1%	N
Shantou	52	0.3%	S	Raipur	6	0.1%	N
Ningbo	39	0.2%	S	Agra	6	0.1%	N
Tangshan	38	0.2%	N	Kalyan-Dombivali	5	0.1%	N
Guilin	30	0.2%	S	Gwalior	5	0.1%	N
				Ranchi	4	0.1%	N
				Jodhpur	4	0.1%	N
				Allahabad	4	0.1%	N
				Meerut	3	0.0%	N
	17,367				7586		

N = North; S = South; W = West.

included these variables to exclude the economic effects of the location (Kearney, 2006).

3.4. Analysis

The first analysis uses the independent sample *t*-test. It estimates the standardised mean difference and the size of that differences. The independent sample t-test estimates a statistical difference between the means of two samples. In this analysis, the Cohen's "***d***" $= 2\,\mathrm{t}/\sqrt{df}$ (Mean difference/std. Dev.) stands for that effect size. Because both measures produce a similar result, we include the $\boldsymbol{d} = (2\,\mathrm{t}/\sqrt{df})$ in the report. Thus, the Cohen's "***d***" shows the standardised difference between the two means.

The second analysis captures the logistic regression, which rests on the non-parametric assumptions. The non-parametric model presents a choice between Logit and Probit analysis. The Probit model needs a normal distribution of latent variables; the Logit works without normal distribution. Second, unlike the Probit model, the Logit model generates standardised coefficients for interpretation. These reasons support the Logit model over the Probit model. The logit model estimates the probability p that the focal morbidity exists in China versus India through the predictors X and the function f(X).

$$f(X) = \frac{1}{1 + e^{-X}}$$

In this expression, factor X denotes the aggregated contribution of all other factors. Thus, the role of X in the model shows the logit function.

$$X = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \ldots + \beta_\kappa x_k$$

The components of the variable X are in small letters (subscripts). Expressions$\beta_1 + \beta_2 + \beta_3 + \ldots + \beta_\kappa$ = Regression coefficients of $x_1 + x_2 + x_3 + \ldots + x_k$. The intercept shows the value of X when the value of all factors reaches zero. Each of the regression coefficients (e.g.$\beta_1 + \beta_2 + \beta_3 + \ldots + \beta_\kappa$) describes the size of the contribution of that factor. The following variables exit in the model.

β_0 = the intercept when other variables set to zero
$\beta_1 x_1$ = coefficient of diabetes
$\beta_2 x_2$ = coefficient of infections
$\beta_3 x_3$ = coefficient oflungs
$\beta_4 x_4$ = coefficient of liver
$\beta_5 x_5$ = coefficient of cancer
$\beta_6 x_6$ = coefficient of hypertension
$\beta_\kappa x_k$ = coefficients of xk variables (control variables)

Table 2
Descriptive statistics.

Variables	N	Minimum	Maximum	Mean	Std. deviation
Diabetes	24,953	0	1	0.10	0.30
Infection/HIV	=	0	1	0.06	0.24
Liver/hepatitis	=	0	1	0.12	0.32
Lungs/Asthma	=	0	1	0.12	0.33
Cancer all types	=	0	1	0.45	0.50
Hypertension	=	0	1	0.03	0.18
China vs. India	=	0	1	0.70	0.50
China North vs. South	17,367	0	1	0.53	0.50
India North vs. South	7586	0	1	0.67	0.47
Cardiac/heart	=	0	1	0.23	0.42
Depression/ schizophrenia	=	0	1	0.05	0.22
Arthritis/bone	=	0	1	0.03	0.18
Neurologic/brain	=	0	1	0.08	0.28
Gastric	=	0	1	0.05	0.22
Urologic	=	0	1	0.01	0.12
Kidney/renal	=	0	1	0.03	0.18
Fertility	=	0	1	0.01	0.11
Nutrients	=	0	1	0.00	0.06
Cells/Tissues	=	0	1	0.10	0.29
Anaesthetic/pain	=	0	1	0.02	0.15
Neoplasm (pre-cancer)	=	0	1	0.01	0.12
Anaemia/blood deficiency	=	0	1	0.01	0.09
Eyes/ophthalmic	=	0	1	0.01	0.10
Skin/Dermatologic	=	0	1	0.01	0.08
Male & female vs. either	24,849	0	1	0.91	0.29
Industry funded	24,953	0	1	0.69	0.46
Org. funded	=	0	1	0.31	0.46
Solo funded	=	0	1	0.92	0.27
Joint funded	=	0	1	0.08	0.27
Industry & joint funded	=	0	1	0.08	0.27
Org. & joint funded	=	0	1	0.01	0.08
P0	=	0	1	0.00	0.06
P1	=	0	1	0.03	0.18
P1 & 2	=	0	1	0.02	0.15
P2	=	0	1	0.11	0.32
P2 & 3	=	0	1	0.03	0.17
P3	=	0	1	0.43	0.50
P4	=	0	1	0.13	0.34
Partners	=	0	92	0.91	4.45
Funders	=	1	4	1.08	0.284

P = phase.

4. Results

4.1. Descriptive statistics

Table 2 shows the summary in detail on the two sets of variables: diseases and context. A set of 21 integrated categories stands for the diseases. The first six categories show the main variables. About 45% of all activities represent cancer. The least (3%) value stands for hypertension. Overall, China has about 70% of the activity, and India has the remaining 30% of it. The summary also shows other variables such as actors (partners, volunteers, type), timing (phases), and structure (inter-organisational alliances and methods).

Table 3 shows intervariable correlations. According to the convention, the correlation size between two independent variables violates the assumption when the correlation exceeds 50%. Our results show correlations below 50%.

4.2. Sino-Indian comparison

Table 4 shows *t*-test comparing the Sino–India sample differences on the six projects: (diabetes, infections, lungs/respiratory, hepatitis/liver, cancer, and hypertension). The Diabetes and Infection projects occur more in India; Cancer, Hepatitis and Respiratory projects occur more in China. The coefficient of hypertension shows no significant effect. The effect size of cancer rises to 77.

Table 5 shows regression results on Sino–India comparison. Diabetes, Infection and Respiratory projects occur more in India; Cancer, Hepatitis and Hypertension projects occur more in China. However, the respiratory malfunction appears more in India than China. We predicted it more in China than India. Because of the precise and efficient of its output, we rely on the logic regression prediction. The underlying logic implies that the project entered the country rather than the country entered the project.

Table 6 shows the effect of the Financial Crisis (2007 to 2009) in three models.[1] Model 1 compares the pre-crisis period, Financial Crisis period and post-crisis period. Based on the binary analysis of three periods, China shows decreasing trends in the post-crisis period compared to the pre-crisis period. It means India shows increasing trends during the crisis period and post-crisis period compared to the pre-crisis period. Model 2 integrates these three periods into binary variables. China starts decreasing before and after the crisis period compared to the crisis period, making a bell-shaped curve. India starts increasing before and after the Financial Crisis period, forming a U-shape curve. Model 3 uses the interaction between the crisis period (2007–2009) and projects. Five projects show a decrease in China; cancer projects show an increase in China—compared to India. This way, China appears attractive to innovation projects during the crisis and India during stability.

Table 7 shows *t*-test for North–South comparison in China. Diabetes projects occur more in the North; Lungs, Liver and Cancer projects occur more in the South. Thus, the intra-institutional (policy and culture) differences matter.

Table 8 shows regression results for North–South differences in China. Infections, Respiratory, Hepatitis and Cancer projects occur more in the South; Diabetes and Hypertension projects occur more in the North in China.

Table 9 shows t-test for North–South comparison inside India. Diabetes projects occur more in the South; Liver and Cancer projects exit more in the North. Since Southerners prefer sweet tastes and Northerners prefer salt tastes, the difference makes an interpretive sense.

Table 10 shows regression results for the North–South comparison in India. Diabetes and Respiratory projects occur more in the South; Hepatitis exists more in the North; Infection and Hypertension projects show no statistical difference North–South divide.

5. Discussion

The role of national institutions (i.e. policies and cultural practices) in altering nature predicts the SNT coevolution; the extant research has either overlooked this nexus or partially tackled the intricate links between social intervention and national morbidities. For instance, the industrial policies and cultural practices contribute to the natural environment, and the transformed environment alters its natural path, leading to national morbidities. Similarly, national institutional (i.e. policy and cultural practice) pre-morbidity and post-morbidity interventions explain that Indian society consumes a high amount of raw sugar; hence, it dominates in the diabetes morbidities. China's society consumes a high amount of tobacco and is exposed to industrial hazards (Lancet, 2017); hence, it dominates in the cancer morbidities. Based on the SNT nexus, we used empirical evidence on clinical trial projects from China and India to explore the SNT nexus and support the argument.

Our findings and the integrated framework (SNT) demonstrates a contextualised interpretation of a narrow and broad set of contextual frames—the former context complements the latter (March, 2014). In other words, the narrow contexts provide local meanings, and the broad

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[1] One of the reviewers advised for the inclusion of the crisis

Table 3
Intervariable correlations.

Variables	1	2	3	4	5	6	7	8	9	10
China vs. India	1									
Diabetes	−0.103**	1								
Infection	−0.061**	−0.079**	1							
Lungs	0.030**	−0.119**	−0.027**	1						
Liver/hepatitis	0.080**	−0.093**	−0.010	−0.001	1					
Cancer	0.361**	−0.152**	−0.114**	0.115**	0.151**	1				
Hypertension	−0.002	−0.050**	−0.043**	0.106**	−0.044**	−0.051**	1			
Enrolled/volunteers	−0.069**	0.098**	0.057**	0.029**	−0.069**	−0.206**	−0.020**	1		
Alliance partners	0.069**	−0.033**	0.006	−0.031**	0.005	−0.017**	−0.012	0.132**	1	
Funders	0.042**	−0.008	0.023**	−0.049**	0.014*	−0.012	−0.001	0.083**	0.121**	1

[*] $p < 0.05$.
[**] $p < 0.01$.

Table 4
Independent sample *t*-test (China 1; India 0).

Variables		Summary statistics					*t*-Test statistics					
		Effect size ***d***	Mean	Std. Dev.	Mean difference	F	Sig.	t	df	Sig	Mean diff.	SE diff
Diabetes	A	−0.21	0.08	0.27	0.00	1038.0	0.00	−16.39	24,951	0.00	−0.07	0.00
	NA	−0.27	0.15	0.36	0.00			−14.81	11,666	0.00	−0.07	0.00
Infection	A	−0.12	0.05	0.22	0.00	364.1	0.00	−9.61	24,951	0.00	−0.03	0.00
	NA	−0.16	0.08	0.27	0.00			−8.80	11,973	0.00	−0.03	0.00
Lungs	A	0.06	0.13	0.34	0.00	93.5	0.00	4.77	24,951	0.00	0.02	0.00
	NA	0.08	0.11	0.31	0.00			4.92	15,551	0.00	0.02	0.00
Liver	A	0.16	0.14	0.34	0.00	689.7	0.00	12.62	24,951	0.00	0.06	0.00
	NA	0.21	0.08	0.27	0.00			13.82	18,043	0.00	0.06	0.00
Cancer	A	0.77	0.57	0.50	0.00	9462.2	0.00	61.18	24,951	0.00	0.39	0.01
	NA	1.00	0.18	0.38	0.00			67.54	18,420	0.00	0.39	0.01
Hypertension	A	0.00	0.03	0.18	0.00	0.6	0.45	−0.38	24,951	0.71	0.00	0.00
	NA	−0.01	0.03	0.18	0.00			−0.37	14,280	0.71	0.00	0.00

F = Levine EV *t*-test; China = 17,367; India = 7586; A = EV assumed; NA = EV Not assumed.
(+) sign of *t*-test means China > India; (−) sign of t-test means China < India.
Effect size Cohen's "d" = $2\ t/\sqrt{df}$ or Mean difference/std. Dev.

Table 5
Logistic regression: Sino-India comparison. $^{***}p < .001$, $^{**}p < .01$.

Variables	Model 1	Odd ratio[a]	Model 2	Model 3	Odd ratio[a]	VIF
Constant	0.24(0.02)***	1.28	0.13(0.06)*	−0.05(0.08)	1.0	
Diabetes	−0.36(0.05)***	0.70	−0.37(0.05)***	−0.33(0.05)***	0.7 (1.4)	1.06
Infection	−0.23(0.06)***	0.80	−0.24(0.06)***	−0.26(0.06)***	0.8 (1.3)	1.03
Lungs	−0.15(0.05)***	0.86	−0.14(0.05)***	−0.10(0.05)*	0.9 (1.1)	1.05
Liver	0.21(0.050)***	1.24	0.24(0.05)***	0.22(0.05)***	1.2	1.03
Cancer	1.76(0.03)***	5.81	1.76(0.04)***	1.77(0.04)***	5.8	1.12
Hypertension	0.19(0.08)**	1.21	0.21(0.08)**	0.22(0.08)**	1.2	1.02
Log enrolled			0.02(0.01)*	0.00(01)	1.0	1.08
Partners				0.13(0.01)	1.1	1.03
Funders				0.21(0.06)***	1.2	1.02
−2 Log likelihood	27,063		26,798	26,503		
Chi-square	3591***		3550***	3845***		
NK pseudo R2	0.19		0.19	0.204		
DOF	6		7	9		

DV = [China 1; India 0]; Standard error in parenthesis.
[a] Exp(B); Reverse odds (of India in diabetes, infection and lungs) appears in parentheses.

contexts provide generalised meanings (Swedberg, 2017). For the localised contexts, studies start with morbidities (N) as constitutive realities because they assume divine sources of national morbidities or random occurrence of natural events. Our study assumes pre-morbidity intervention of the national culture and policies, suggesting that the society (S) contributes to the formation of national morbidities. The social intervention in childbirth explains this biosocial relationship (Mansfield, 2008). Medical policies and national cultures shape the intervention in the childbirth. Similarly, social influence on the foetus, from conception to childbirth, directly intervenes in the life of the foetus. Two anecdotes reinforce these back-and-forth linkages in the SNT nexus in the pre-nature intervention.

One anecdote suggests that the gender preference (male foetuses over female) in India depicts pre-nature social intervention. The other anecdote suggests that the temporal and location preferences for childbirth in China represent pre-nature intervention. Many Chinese women planned to give birth during the year of Monkey, believing that the child would be smart. Similarly, some families align childbirth with

Table 6
Logistic regression: Sino-India in financial crisis (2007 to 2009).

Variables	Model 1	Odds	Model 2	Odds	Model 3	Odds
Constant	13.67(0.45)**	865,076	1.72(0.06)**	5.	0.90(0.01)**	2.4
Financial crisis 07/08/09			−0.39(0.05)**	0.68		
Before financial crises			Default			
After financial crisis			−1.72(0.05)	0.18		
(FC)(Diabetes)					−1.54(0.08)**	0.2
(FC)(Infection)					−1.31(0.10)**	0.3
(FC)(Lungs)					−0.71(0.08)**	0.5
(FC)(Liver)					−0.38(0.10)**	0.7
(FC)(Cancer)					0.59(0.06)**	1.8
(FC)(Hypertension)					−0.52(0.15)**	0.6
Y07	−0.18(0.07)*	0.84				
Y08	−0.44(0.06)**	0.64				
Y09	−0.47(0.06)**	0.62				
Y10	−0.76(0.06)**	0.47				
Y11	−1.12(0.06)**	0.33				
Y12	−1.73(0.07)**	0.18				
Y13	−2.27(0.07)**	0.10				
Y14	−2.04(0.07)**	0.13				
Y15	−2.46(0.08)**	0.09				
Y16	−2.58(0.11)**	0.08				
-log likelihood	27,073		28,218		29,960	
Cox & Snell R square	0.13		0.09		0.03	
DOF	10		2		6	

FC = Financial crisis.
* $p < 0.05$
** $p < 0.01$

Table 7
Independent sample *t*-test on China (North-South).

Variables		Summary statistics					*t*-test statistics					
		Effect size ***d***	Mean	Std. dev.	Mean difference	F	Sig.	t	df	Sig	Mean diff.	SE diff
Diabetes	A	0.04	0.09	0.28	0.00	33.7	0.00	2.90	17,365	0.00	0.01	0.00
	NA	0.04	0.08	0.26	0.00			2.91	17,323	0.00	0.01	0.00
Infection	A	−0.01	0.05	0.21	0.00	1.4	0.23	−0.60	17,365	0.55	0.00	0.00
	NA	−0.01	0.05	0.22	0.00			−0.60	17,052	0.55	0.00	0.00
Lungs	A	−0.07	0.12	0.32	0.00	90.4	0.00	−4.75	17,365	0.00	−0.02	0.01
	NA	−0.07	0.14	0.35	0.00			−4.73	16,726	0.00	−0.02	0.01
Liver	A	−0.11	0.12	0.32	0.00	191.9	0.00	−6.92	17,365	0.00	−0.04	0.01
	NA	−0.11	0.15	0.36	0.00			−6.87	16,515	0.00	−0.04	0.01
Cancer	A	−0.23	0.52	0.50	0.01	613.9	0.00	−14.94	17,365	0.00	−0.11	0.01
	NA	−0.23	0.63	0.48	0.01			−14.97	17,246	0.00	−0.11	0.01
Hypertension	A	0.00	0.03	0.18	0.00	0.3	0.57	−0.28	17,365	0.78	0.00	0.00
	NA	0.00	0.03	0.18	0.00			−0.28	17,086	0.78	0.00	0.00

F = Levine EV *t*-test; North = 53%; South = 47%; A = EV assumed; NA = EV Not assumed;
(+) North > South; (−) North < South.
Effect size Cohen's "*d*" = $2\,t/\sqrt{df}$

the school-entry calendars, and others move to high-status countries. These examples explain that the social–nature (SN) link in the SNT nexus exists because of social status and policies. The second anecdote cites an interfamily marriage as a social motion behind the emerging childbirth deformities, and it conforms to Dawkins' (1989) argument on the social–nature coevolution. The small town of "Kalay", near Peshawar city in Pakistan, has 350 households and above-average rates of congenital deformities. Observers report that the local culture has perpetuated interfamily marriages in this village for decades, causing multiple deformities in every third child born in the (Ullah, 2015). Because interfamily marriage depends on strong cultural forces and weak policy (e.g. education) development, the pre-morbidity intervention of norms in the SNT makes sense in the context of this anecdote. Both anecdotes explain pre-morbidity intervention of the society in nature.

Does national culture explain post-morbidity intervention in nature? The literature provides a broader contextual interpretation of whether society shapes policies and practices in treating national morbidities. Multiple studies support the influence of national policies and practices in the post-morbidity industrial response. One study demonstrates that national morbidities have social statuses, and the status of the morbidity attracts the normative medical response (Album and Westin, 2008). For instance, US doctors prefer surgeries to prescriptions; French doctors prefer treating the liver to other organs; German doctors prefer prescribing medicines for heart disease and low blood pressure to other abnormalities (Mechanic, 2002). These cross-cultural practices indicate that the culturally driven sociotechnical responses vary to treat the intrinsically neutral disease. Therefore, national institutional intervention may occur as a preventive or curing mechanism (Nicolaisen, 2009).

The institutional intervention for preventive measures (pre-morbidity) strongly relates to enculturation; the institutional intervention for curing measures (post-morbidity) relates to the industrial response. The enculturation depends on the education policies and practices; the industrial response depends on the innovation policies and practices. Either alone describes a part of the SNT nexus; the combination

Table 8
Logistic regression: China (North-South). ***p < .001, **p < .01, *p < .05.

Variables	Model 1	Odd ratio[a]	Model 2	Model 3	Odd ratio[a]	VIF
Constant	0.43(0.03)***	1.54	0.22(0.07)***	0.14(0.09)		
Diabetes[b]	0.03(0.06)	1.03	0.01(0.06)	0.01(0.06)	1.0	1.04
Infection	−0.15(0.07)*	0.86	−0.16(0.07)**	−0.16(0.07)*	0.9	1.02
Lungs	−0.16(0.05)***	0.85	−0.16(0.05)***	−0.16(0.05)***	0.8	1.03
Liver	−0.25(0.05)***	0.78	−0.24(0.05)***	−0.24(0.05)***	0.8	1.02
Cancer	−0.44(0.03)***	0.65	−0.42(0.03)***	−0.42(0.03)***	0.7	1.09
Hypertension[b]	−0.08(0.09)	0.92	−0.07(0.09)	−0.07(0.09)	0.9	1.02
Log enrolled			0.03(0.01)***	0.03(0.01)	1.0	1.09
Partners				0.00(0.00)	1.0	1.04
Funders				0.07(0.050	1.1	1.02
−2 Log likelihood	23,749		23,580	23,576		
Chi-square	268***		279***	282***		
NK pseudo R2	0.02		0.02	0.02		
DOF	6		7	9		

DV = [North 1; South 0]; Standard error in parenthesis.

[a] Exp(B);

[b] Positive (liver and cancer); Negative (diabetes, lungs, hypertension) at $p < 0.05$

Table 9
Independent sample t-test on India (North-South).

Variables		Summary statistics					*t*-Test statistics					
		Effect size ***d***	Mean	Std. dev.	Mean difference	F	Sig.	t	df	Sig	Mean diff.	SE diff.
Diabetes	A	−0.13	0.13	0.34	0.00	130.4	0.00	−5.82	7584	0.00	−0.05	0.01
	NA	−0.17	0.18	0.39	0.01			−5.56	4344	0.00	−0.05	0.01
Infection	A	0.01	0.08	0.27	0.00	0.7	0.40	0.42	7584	0.68	0.00	0.01
	NA	0.01	0.08	0.27	0.01			0.42	4937	0.68	0.00	0.01
Lungs	A	−0.04	0.10	0.31	0.00	10.0	0.00	−1.59	7584	0.11	−0.01	0.01
	NA	−0.05	0.12	0.32	0.01			−1.56	4663	0.12	−0.01	0.01
Liver	A	0.09	0.09	0.28	0.00	65.7	0.00	3.99	7584	0.00	0.03	0.01
	NA	0.11	0.06	0.24	0.00			4.23	5648	0.00	0.03	0.01
Cancer	A	0.08	0.19	0.39	0.01	50.1	0.00	3.47	7584	0.00	0.03	0.01
	NA	0.10	0.16	0.36	0.01			3.56	5208	0.00	0.03	0.01
Hypertension	A	−0.03	0.03	0.18	0.00	6.5	0.01	−1.28	7584	0.20	−0.01	0.00
	NA	−0.04	0.04	0.19	0.00			−1.24	4543	0.21	−0.01	0.00

F = Levine EV *t*-test; North = 67%; South = 33%; A = EV assumed; NA = EV Not assumed;
(+) North > South; (−) North < South.
Effect size Cohen's 'd' = $2\ t/\sqrt{df}$.

Table 10
Logistic regression: India (North-South).

Variables	Model 1	Odd ratio [a]	Model 2	Model 3 [b]	Odd ratio [a][b]	VIF
Constant	0.77(0.03)***	2.2	0.81(0.10)***	0.89(0.14)***	2.4	
Diabetes	−0.37(0.07)***	0.7	−0.36(0.07)***	−0.37(0.07)***	0.7	1.1
Infection	−0.01(0.09)	1.0	0.00(0.09)	0.02(0.09)	1.0	1.1
Lungs	−0.22(0.08)**	0.8	−0.22(0.08)**	−0.23(0.08)***	0.8	1.1
Liver	0.31(0.10)***	1.4	0.28(0.10)***	0.28(0.10)**	1.3	1.1
Cancer	0.14(0.07)*	1.1	0.13(0.07)	0.13(0.07)	1.1	1.2
Hypertension	−0.13(0.14)	0.9	−0.13(0.14)	−0.13(0.14)	0.9	1.1
Log enrolled			−0.01(0.02)	0.00(0.02)	1.0	1.1
Partners				−0.02(0.02)	1.0	1.2
Funders				−0.10(0.10)	0.9	1.3
−2 Log likelihood	9510		9393	9390		
Chi-square	58***		55***	58***		
NK pseudo R2	0.011		0.01	0.011		
DOF	6		7	9		

DV = [North 1; South 0]; Standard error in parenthesis

[a] Exp(B);

[b] Positive (liver, cancer, and hypertension); Negative (diabetes, lungs) at $p < 0.05$

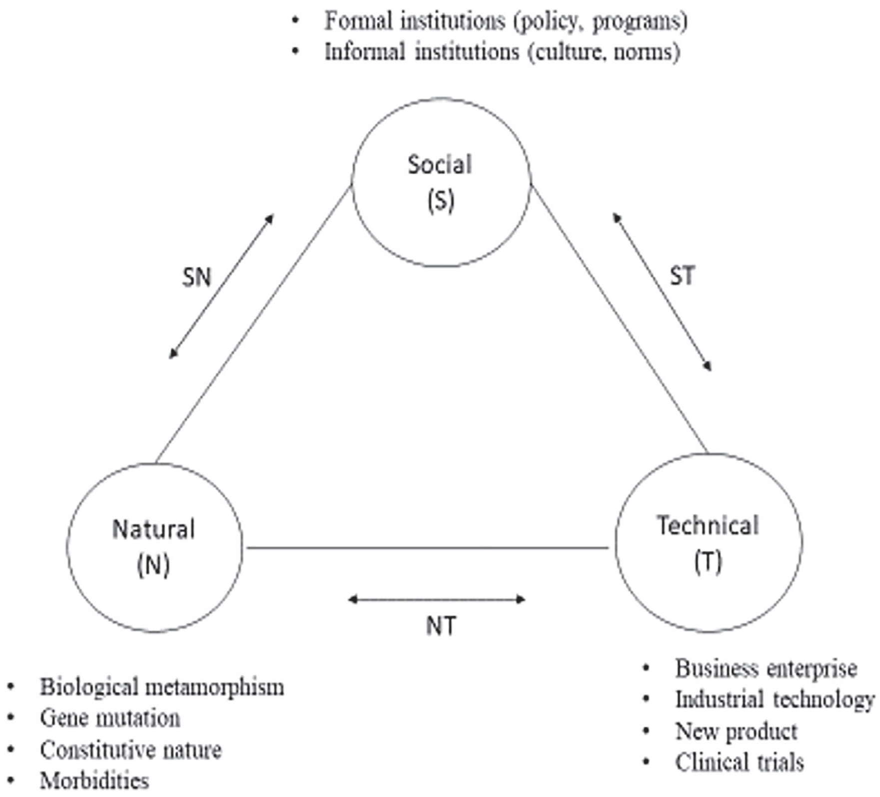
describes the SNT integration proposed in this study. Two Noble Laureates suggest that national institutions integrated economic growth, such as industrialisation, and social development, such as education and healthcare (Deaton, 2013; Sen, 1999). In other words, economic growth through industrial development and national policies for social development coevolve (Deaton, 2013; Sen et al., 2010). Together, the institutional role in the SNT nexus finds support from the interdependence on economic growth and social development, and either alone lacks the integrated framework (Deaton, 2003; Sen et al., 2008).

The limited focus on economic growth removes social development from coevolution; the focus on social development omits the economic resources to support education and healthcare. Amartya Sen (1992) and Angus Deaton (2008) provide detailed accounts of these relationships. Our study goes a step further to support the order of pre- and post-nature interventions in the SNT perspective, and we suggest that pre-morbidity intervention takes precedent. This position stresses that national education, aligned with the prevention logic, will also improve economic and social opportunities. Education reduces poverty and inequality and develops health care directly and indirectly. Directly, the educated mass takes part in the development across different spectrums, such as scientific, technical, and market resources. Indirectly, it can draw the attention of policymakers and influence the political process. Without education, creating awareness of the problem, policies, and practices fail. Thus, the national education system offers policy and practice solutions for the mental freedom that Amartya Sen purports throughout his writing and public discourses.

For a comprehensive understanding, we integrate the findings into three perspectives to explain the role of the SNT nexus and its implication for preventive education. The first perspective aligns with Amartya Sen's (1990) capability expansion, the second with Angus Deaton's (2003) education variable behind the inequality and health correlation, and the third with Richard Dawkin's (1989) social–nature coevolution in the “selfish gene” theory. According to Amartya Sen, the role of the capability to create policy outweighs the resource existence of resources and growth. Without increasing the capability, growth fails to translate into education, healthcare, and inequality reduction, as in the case of India (Drèze and Sen, 2013). According to Angus Deaton (2013), national education can help manage inequality and poor health and implies that improvement in education can improve equality and general health for the societal well-being. Richard Dawkin's (1989) selfish gene argument suggests that genetic forces set the path of human behaviour. However, social intervention can mitigate the forces to set national trajectories. If national education type, level, scope, and timing are crucial, then the national preference for prevention or cure is also important. We conclude that the glorified policies and cultural rituals and norms require a balance between pre-nature formation and post-nature industrial response—preventive glory creates better results than curative glory.

We acknowledge that our study has omitted the public–private partnership in the healthcare sector and industrialisation process—China and India differ in the partnership. Our study neglects to analyse the urban–rural paradox: Although urban areas attract clinical trial projects because of their developed related infrastructure, their residents develop morbidities due poor nutrition intake, inadequate physical activity, and unhealthy environmental quality. For instance, the global fast-food chains have a larger presence in urban areas than rural areas in China and India. However, the urban areas have the higher education required to prevent morbidities more than rural areas. Thus, this research riddle remains for another time.

Appendix A. The SNT triad concepts and interlinkages.



Note: The appendix complements Fig. 1

Appendix B. Sources of health issues in China and India.

Comparative social & health patterns	China	India	Ratio
Diabetes(H1)			
Sugar consumption grams daily	33 g	58 g	0.57
Adult population diabetes (2005)[a]	2.7%	8%	0.3
Infectious (H2)			
Infectious in population (HIV)	0.4%	1.92%	0.19
HIV related deaths[e]	0.42%	1.52%	0.28
Drug use[e]	0.4	0.7	0.57
Infection risk (CIA fact book)	Intermediate (3)	Very high (5)	0.6
Vaccine market	34%	59%	0.58
Open defecations & sanitation	1 < %	47%	0.02
Hepatitis/liver(H3)			
Hepatitis B proportion of the world	33%	15%	2.20
Liver related deaths (2014)[e]	3.9%	2.4%	1.63
Lungs/Asthma (H4)			
Smoking % of adult population[c]	49%	23%	2.13
Male daily cigarette smoking[d]	44.6	6.3	7.08
Female daily cigarettes smoking	1.9	0.6	3.2
Both genders cigarettes smoking	23.6	3.6	6.6
Respiratory disease	15%	11%	1.4
Cancer (H5)	21%	6%	3.5
(smoking, pollution, & food contamination)			
Hypertension (H6)	2.72%	1.79%	1.52
Alcohol per capita (age 15+)[b]			
Males	18.7	32.1	0.6
Females	7.6	10.6	0.7
Both sexes	15.1	28.7	0.5
Change (2008–2010)	6.7	4.3	1.6
Others (life expectancy years)[e]			
Male	74.6	66.9	1.12
Female	77.6	69.9	1.11

[a] WHO (2015a, b): Integrated or topic-specific policy: China (only cancer-specific); India (all except Chronic respiratory diseases); in 2014, China (2.49); India (2.56)

[b] WHO (2015c): Total alcohol per capita (15+) consumption, drinkers only (in litres of pure alcohol)

[c] WHO (2015d): Smoking prevalence

[d] WHO: Adult Tobacco Survey ages 15+ (China data 2009)

[e] (WLE, 2016)

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