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Intercultural Differences in Road Safety Performance and Support for Road Safety Policy Measures

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Abstract

Road safety policy measures are meant to improve road safety, i.e., to reduce the number of people injured or killed in road traffic crashes. Despite the obvious benefits of such policy measures, often public support is low, because often such measures require road users to give up some of their freedom of movement. In this chapter, it is shown how differences in national culture are associated with differences in the level of public support for a range of policy measures. National culture can be operationalized into several dimensions. Using data from a recent update of two of Hofstede's cultural dimensions (labeled as "Independent" and "Confucianist"), it is first shown that these dimensions are strongly associated with economic indicators and road safety performance. Subsequently, it is illustrated that these dimensions can also be good predictors for public support for several road safety measures, in particular when these are perceived to restrict freedom of movement.

Keywords: culture, road safety, fatality rate, public support, policy measures, ESRA, Hofstede, independent, Confucianist

1. Introduction

'Road safety' refers to both a policy area and a scientific discipline, addressing incidents, accidents, and injuries that occur in traffic. A collision with a vehicle, road user, or an obstacle on the road is often called an 'accident' or a 'road accident.' Increasingly, however, experts and policy makers prefer to use the term 'crash' or 'road crash,' because in English, 'accident' includes the connotation that the event could not have been avoided. The European Commission has recently decided to use the term (road) crash in its communications on road safety. 'Crashes' are also used in the recent international Stockholm declaration on road safety [1]. In this chapter, the terms 'crash' or 'road crash' are used. Please note that in road safety research and policy, the focus is on 'injury crashes,' referring to road crashes in which at least one person is injured or killed.

Road crashes are one of the major causes of deaths and injuries across the globe. The World Health Organization (WHO) estimated that in 2016, over 1.35 million people died on public roads and over 50 million were injured [2]. Despite considerable

progress over the last four decades, particularly in Europe and other highly developed countries, it remains an important challenge for all countries to reduce the number of road casualties and fatalities. Actually, over the last years (except during the Covid-pandemic), in several European countries, the number of road crash fatalities was no longer decreasing [3, 4]. In many low- and middle-income countries (LMICs), the numbers are still increasing [5].

Despite lack of consensus on what national culture exactly entails, it is in generally accepted that it is a key characteristic underlying systematic differences in behavior between countries [6]. The insight that national culture also affects road safety performance is not new. In 2000, a road safety target hierarchy was developed in New Zealand under the form of a ‘road safety pyramid’ [7]. This concept subsequently gained popularity in the road safety world [8]. The pyramid included several layers, with the basic layer being ‘structure and culture’ (of a country). This road safety pyramid has often been used as a framework for assessing national road safety performance [8, 9] and for benchmarking – e.g., [10]. Within this logic, culture is seen as an input factor (in addition to demography, geography, climate, political organization, etc.) for road safety policy and interventions. In other words, cultural characteristics influence how and what policy measures can be taken, and eventually road safety performance. However, for this ‘culture and structure layer,’ there are no internationally comparable quantitative indicators.

2. Operationalization of ‘culture’

2.1 What is culture?

The Oxford Learners Dictionary (<https://www.oxfordlearnersdictionaries.com/>) gives six meanings of the term ‘culture,’ of which the first one comes close to the concept of culture used in this chapter: “*the customs and beliefs, art, way of life and social organization of a particular country or group.*” Scientific consensus tends to emerge around two key characteristics of this concept of culture: (a) culture as a collective phenomenon that is shared among members of a cultural group – this ‘shared’ component tends to distinguish one group of people from another, and (b) culture is learned and passed on through socialization processes within these cultural groups [11].

Culture shapes society and vice versa. Culture itself is a product of various factors, including tradition, history, and how systems such as regulation, education, law enforcement, the labor market, social security, public health, and infrastructure function. For instance, in many societies, the attitudes toward drunk driving have changed considerably since the late twentieth century [12] – a cultural change that was the result, at least in part, of changing legislation and increasing enforcement levels.

Culture is not static. There is some evidence for a global shift in the direction of cultural traits typical of the rich Western individualist countries [13]. This is strongly linked to economic and human development and the associated evolution from a priority on existential security toward expressive freedom [14]. In general, greater economic prosperity and equality eventually lead to more tolerant, egalitarian, autonomous, and trusting societies [15]. Younger generations across the world have become more individualistic and more joyous [16]. On the other hand, it was also observed that roughly half of the variation in national cultural orientations is unique

to each country. The latter observation is consistent with another finding [17] that despite increasing international interconnectivity, national culture remains strong due to it referencing itself when interpreting new information.

2.2 Natural culture

Following Hofstede et al. [18], national culture should be seen as the collection of norms, beliefs, values, and practices that distinguish the citizens of one country from those of another. Hofstede assumed that all societies face similar basic challenges such as inequality, an uncertain future, and the relationship between individuals and groups [19]. However, societies tackle these challenges differently, and these different practices are part of their culture. National culture has a regulatory role in that it determines the behavior that is considered normal and acceptable within a country – see e.g., [20].

An important achievement of Hofstede was his finding that (national) culture could be operationalized through a number of cultural dimensions. This paved the way for comparing the culture of countries numerically and also incorporate national culture as a variable in statistical modeling and analysis. A range of cultural variables, factors, and dimensions have been developed by different social scientists using different perspectives. While Hofstede started from measuring culture in the workplace in general, Schwartz' cultural value orientations were based on analyzing common problems faced by every society and the societies' preferences in addressing these issues [21]. The GLOBE (Global leadership and organizational effectiveness) study was mainly interested in the effect of culture on leadership styles [22]. The World Value Survey analyses [14, 22–25] focused on the effect of culture on political attitudes and changes thereof over time.

Hofstede initially introduced four dimensions and later expanded these to six (see **Table 1**). Scores not originating from Hofstede's initial research have been added over the years, mostly through various specific research projects, such as those reported in [26, 27].

It was recently shown [29] that most dimensions of the different cultural models can be clustered into two main factors: one 'superfactor' that reflects the combined effects of development and modernization, together with social-psychological effects such as collectivism, conservatism, regality, and tightness. The second factor combines several effects related to East Asian cultures and possibly also differences in response style.

2.3 Two key dimensions of national culture

Recent research has led to an update of two of Hofstede's original dimensions: 'individualism versus collectivism' and 'long-term versus short-term orientation' [30–32]. The update of the other dimension was called 'Flexibility versus Monumentalism' [33]. Some characteristics of these two dimensions are shown in **Table 2**.

In individualist cultures, the ties between individuals are loose and people are expected to look after themselves. In collectivist cultures, people are integrated into cohesive in-groups that continue protecting them in exchange for unquestioning loyalty and oppose other in-groups. Collectivist societies tend to divide people into in-groups and out-groups. In-group members get tolerance, respect, and various privileges, but people from out-groups are excluded from the circle of those who deserve

Power distance	How a society generates solutions to resolve inequality among members
Uncertainty avoidance	The cultural tendency to be uncomfortable when encountering an unknown future
Individualism versus collectivism	The societal position on the value of loose ties among members versus the integration of members with their own groups
Masculinity versus femininity	The cultural tendency for differentiating emotional roles based on gender
Long-term versus short-term orientation	The cultural preference of placing individuals' focus on the future versus on the past and present
Indulgence versus restraint	The culture preference for gratification versus control of basic human desires related to enjoying life

Source: [28], based on publications by Hofstede [18, 19].

Table 1.
Hofstede's six traditional cultural dimensions.

Individualism versus collectivism ('Independent')	Individualistic societies stress the needs and rights of the individual while collectivist societies start from the needs of the group as a whole. Important values in individualistic countries include personal freedom, autonomy, uniqueness, self-reliance, hedonism, and assertiveness. Within collectivist societies, important attitudes are conformity, restrictiveness, power seeking, dependency, conflict avoidance, and in-group favoritism.
Flexibility versus monumentalism ('Confucianist')	Flexible cultures emphasize adaptability, a modest opinion of one's self, and reluctance to help people. In monumentalist cultures, people prefer to stay the same, have high self-regard and self-confidence, and want others to feel good about them.

Source: [28], based on publications by Minkov [30, 32–34].

Table 2.
Hofstede's two updated cultural dimensions.

any privileges. Nepotism and corruption are more widespread in such cultures. On the other hand, in 'individualist' cultures, the distinction between in-groups and out-groups is much smaller. There is a more universalist treatment of all people in the public sphere, and there is more transparency and rule of law [35, 36]. Collectivistic cultures are predominantly found in the developing world.

The dimension 'Flexibility versus Monumentalism' explains some of the cultural differences between the Confucian societies of East Asia at one extreme and Africa, the Middle East and Latin-America on the other [30]. It is closely related to Fog's 'East-Asian factor.' The cultures which are strong on this dimension exhibit thrift, persistence, ordering relationship by status, and sense of shame, all of which are characteristic of East-Asian countries [29, 37]. Unlike for 'Individualism versus Collectivism,' the theoretical concepts behind this dimension appear to be incoherent. It is also difficult to explain why these cultural characteristics are related to each other [34, 38].

Like in my PhD Thesis [28], I have given these two updated dimensions a shorter name. 'Individualism versus Collectivism' is renamed as 'Independent.' This avoids confusion with the traditional Hofstede cultural dimension 'Individualism' and stresses the independent thinking which characterizes individualist societies. The dimension 'Flexibility versus Monumentalism' is called 'Confucianist.' Please note that the traditional Hofstede dimension 'Long term orientation' was initially actually labeled as 'Confucian work dynamism' [37].

2.4 Cultural clusters of countries

Figure 1 is a scatterplot based on the data of Independent and Confucianist, similar to one initially published by Minkov [30]. He stated that “*This new map of the world is very much like the real one, drawn from a traditional European perspective, without the world’s oceans. There is one logical exception: the English-speaking countries are not scattered across the world but form a fairly compact cluster right above the center of the map.*” ([31], p. 251). Or, simplistically but also thought provoking, the two dimensions could also be labeled as “North-South” and “East-West,” with the “Anglo world” in the center.

Despite their different perspectives, the different international cultural models often identify similar cultural clusters of countries. The GLOBE researchers divided the world into regional cultural clusters with some typical value characteristics, which are shown in **Table 3**.

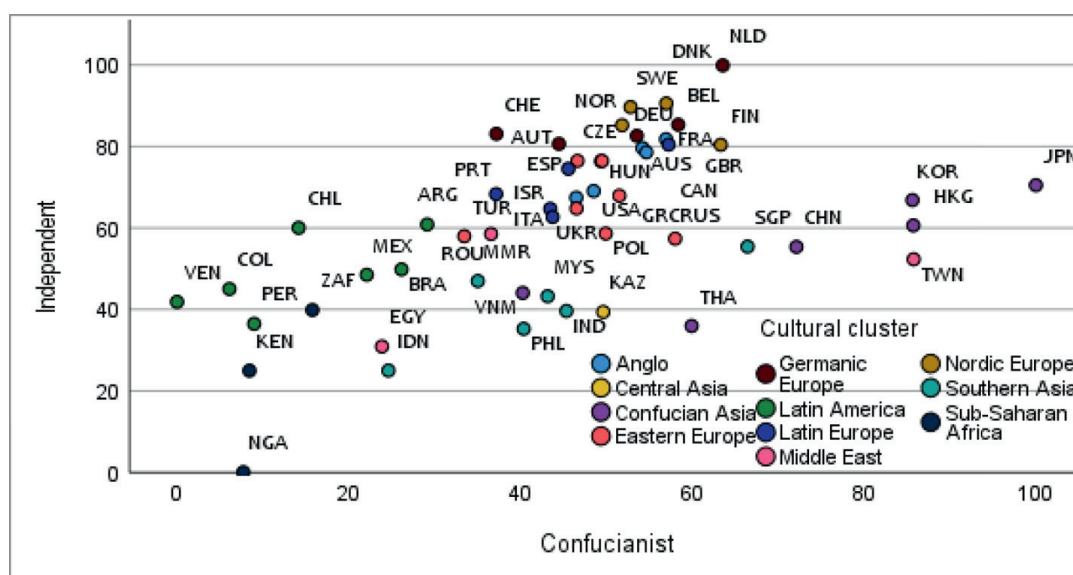


Figure 1. Mapping of countries based on the two main cultural dimensions. Data source: [28], Based on data provided by Hofstede insights.

Cultural cluster	Some typical value characteristics
Anglo	competitive; result oriented
Germanic Europe	value competition; aggressiveness; more result oriented
Eastern Europe	forceful; supportive of co-workers; treat women with equality
Nordic Europe	priority on long-term success; women treated with equality
Latin Europe	individual autonomy
Latin America	loyal and devoted to their families and similar groups
Middle East	loyal and devoted to their own people, women have less status
Sub-Sahara Africa	concerned and sensitive to others; strong family loyalty
Southern Asia	strong family oriented; deep concern for their communities
Confucian Asia	result driven; encourage working together over individual goals

Table 3. Cultural clusters of countries, based on the GLOBE project [39].

Other researchers have come to very similar clusters [40]. These authors observed that some clusters, such as the Arab (Middle East) and the Anglo one, are much more cohesive than others, such as the Latin American and Confucian cluster.

2.5 Association of culture with socioeconomic indicators

Table 4 shows the correlation between the Independent and Confucianist dimensions and some economic, social, and educational indicators. All these correlations, except between Gender Gap and Confucianist, are (very) strong and significant at the $p < 0.01$ level. Thus, the Independent and, to a lesser extent, the Confucianist cultural dimensions are strongly associated with economic, human, and social development.

Given the very high correlation, one can even consider the Independent dimension to be a good proxy for human development, equality, and gender equality. The strength of these correlations is striking; they are also stronger than those found in earlier analyses based on the old Hofstede values. This result is even more surprising because the data sources for these indicators are very different: the independent dimension is based on questions to people about their values, attitudes to people and society, behavior, etc., while HDI, the Inequality Index, and the Gender Inequality Index are derived from national social and economic statistics. For example, HDI is based on life expectancy, education level, and income (<http://hdr.undp.org/en/content/human-development-index-hdi>). **Figure 2** illustrates the association between Independent and HDI.

As **Table 4** shows, the correlations between Confucianist and the socioeconomic indicators are also high, except with Gender Gap. The findings in relation to education are consistent with those of Minkov, Bond, et al. [34] who observed the strong association between Long-Term Orientation and educational performance.

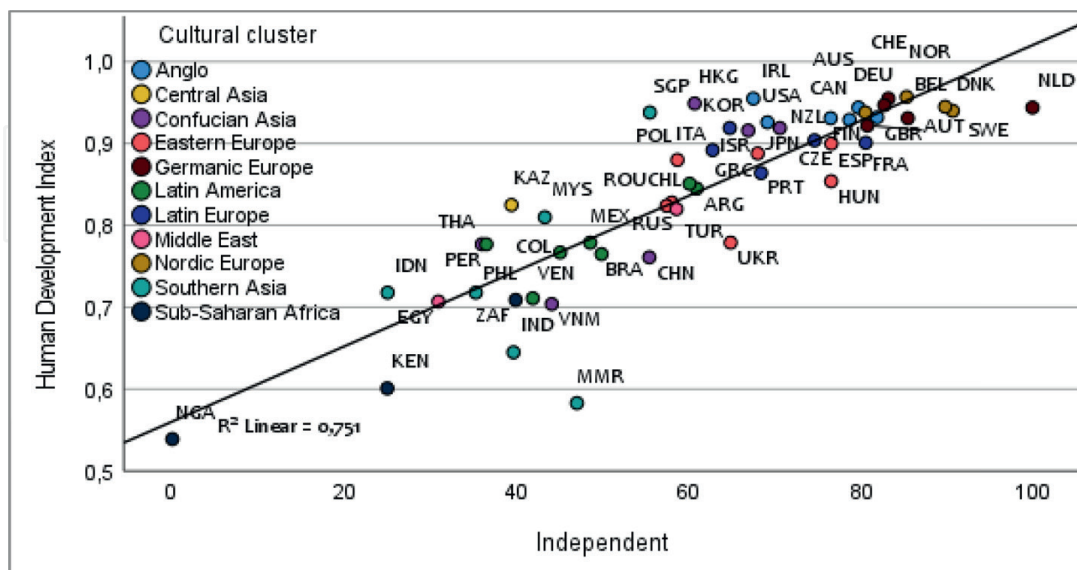


Figure 2. Association between the human development index and the independent cultural dimension. Data source: Hofstede insights (culture) and UN (human development).

	Independent	Confucianist
Gross National Income per capita (WHO)	0.756**	0.546**
Human Development Index (HDR-UNDP)	0.867**	0.614**
Gini index (World Bank)	-0.461**	-0.356**
Inequality Index (HDR-UNDP)	-0.834**	-0.621**
Gender Gap (WEF)	0.567**	0.110
Gender Inequality Index (HDR-UNDP)	-0.861**	-0.682**
Education index (UNESCO)	0.844**	0.539**
Skilled labor force (ILO)	0.726**	0.575**

** : $p < 0.01$.

Table 4.
Correlation between culture and economic, social, and education indicators.

3. The association between culture and road safety

3.1 Indicators for road safety performance

Several indicators can be used for analyzing and comparing road safety performance. The road crash fatality rate most used in international comparisons is the crash fatality rate per capita, and more specifically the fatality rate per 100,000 population. I will refer to this as the ‘crash fatality rate’ or ‘fatality rate.’

The World Health Organization (WHO) collects data on road safety fatalities and context information. The data are reported in the Global Status Report on Road Safety, of which I used the most recent version, referring to fatalities in 2016 (WHO, 2018). The fatality figures published by the WHO are estimates based on statistical modeling. Particularly in LMICs, these estimates are considerably higher than the countries’ official statistics on fatal road crashes.

Table 5 includes average fatality rates across cultural clusters of countries. The best performance is achieved in Nordic, Germanic, and Latin Europe, while Sub-Saharan Africa scores worst. The poor road safety performance of LMICs is not a new phenomenon; it has been observed and documented in the past [5, 41].

3.2 National road safety culture

The behavior of road users in traffic can be seen as an expression of the national culture. For example, if the national culture in a particular country highly values risk taking, risky behaviors on the road are likely to be more acceptable in that country than elsewhere. And if the national culture is strongly opposed to governmental interventions, one can imagine a strong resistance against road safety measures seen to restrict freedom of mobility.

Minkov mentions various studies showing that compliance with traffic law is more typical of the rich individualist countries than of the developing collectivist countries [36]. A literature review showed that people in high-income (and hence more individualistic) countries are more likely to comply with red traffic lights than people from developing countries (which are more collectivistic) [42]. Based on a

Cultural cluster	N	Fatality rate
Anglo	6	6.5
Nordic Europe	5	4.2
Germanic Europe	6	4.7
Latin Europe	5	5.4
Eastern Europe	24	10.1
Central Asia	8	16.2
Confucian Asia	8	17.9
Southern Asia	13	15.2
Middle East	19	16.5
Sub-Saharan Africa	44	27.5
Latin America	26	17.4
Other	9	12.6
Average		16.9

Data source: WHO.

Table 5.
Crash fatality rates by cultural cluster of countries.

study of 15 EU countries, it was found that the social willingness to comply with the law had significant positive effects on traffic fatalities [43]. Other researchers found that law enforcement can explain the relationship between culture and fatality rates, in particular for speed, helmet, and child restraint systems [44]. Thus, compliance with traffic regulations and the scope and extent of traffic law enforcement shape the national road safety culture and hence the road safety performance.

‘Road safety culture’ can be seen as a container concept referring to road users’ safety attitudes and behavior in traffic. Taking such a perspective on road safety culture has the advantage that a huge number of research findings are available on the behavior and attitudes of road users. Some of these studies include sufficient variables to create sub-groups and compare components of road safety culture between groups, such as, for instance, attitudes toward drunk driving, using a helmet, respecting red lights, and approaches to law enforcement. It has also been argued that the relatively high crash risk of young drivers is related to a subculture encouraging risk engagement and risk taking [45]. In particular, sensation seeking appears to correlate with risky-driving mistakes in driving and road crashes [46–48].

‘Traffic Safety Culture’ (TSC) is a recent perspective on road safety culture. The TSC concept evolved out of organizational safety culture in the United States [49], where it was of particular importance for companies working in hazardous environments. Originally TSC referred to a strong road safety culture within companies, but it was gradually given a broader meaning and gained interest outside the United States (e.g. [50]). Edwards et al. define TSC as “the assembly of underlying assumptions, beliefs, values and attitudes shared by members of a community, which interact with the community’s structures and systems to influence road safety related behaviours.” [55, p.296] Another definition by Ward is: “The shared beliefs of a group that affect behaviors related to traffic safety” [56, p.32]. The authors further state that “the traffic safety culture of a group emerges from actions taken by stakeholders across the social ecology” (ibid.

p.33), whereby stakeholders not only refer to public authorities but also to families, schools, and workplaces. Within a country, there can be a series of nested cultures that together form TSC and have an effect on safety [51].

Efforts have been made to operationalize TSC into quantitative indicators. One study found that the factors that explained the most variance in TSC were support for increased government attention to traffic safety, strict monitoring and control of alcohol-impaired drivers, disapproval of speeding, and avoidance of aggressive driving [52]. It has been proposed to measure traffic safety culture by analyzing the components of shared beliefs, such as values, assumptions, attitudes, perceived norms, perceived self-efficacy, etc. and link these to behavior [53]. A study showed that data from the fourth SARTRE survey [54] allowed to distinguish five TSC components and compare these across European countries: acceptance of safety technology and enforcement; attitudes toward risks; behavior control; personal concern for road safety; and perception of other road users' safety performance [55]. Yet, despite such efforts, there appears to be no scientific consensus on what TSC really entails and what indicators would be most appropriate.

3.3 Association of culture with behavior and perceptions of road users

International data on risky behavior in traffic can be obtained from the ESRA2 database. ESRA2 refers to the second version of ESRA (E-Survey of Road Users' Attitudes). The ESRA data are collected through online market panels, the sample of respondents being representative for the adult population of the participating country [56]. The ESRA indicators refer to the percentage of people self-reporting to have engaged in such behavior at least once over the last month. In the WHO Global Status Report, some estimates on risky behavior are also available, based on observation studies [2].

Table 6 lists the Pearson correlations of Independent and Confucianist for several risky behaviors in traffic, derived from ESRA and WHO data. The table shows strong associations between Independent and the risky behavior listed, but these have different directions. In more individualistic societies, people exceed speed limits more often than in collectivist ones, despite the more numerous speeding controls. This is not just a result of culture, however. In many collectivist countries, which are often less developed, speed limits are often high or inexistent and the state of the roads and vehicles makes it difficult to exceed the speed limits. As regards distraction and use of protective systems, Independent societies seem to behave less risky in traffic. There is no correlation between driving with a BAC above the legal limit and independent, neither at global nor at European level. On the other hand, Confucianist is moderately negatively correlated with driving with a BAC above the legal limit. Thus, there tends to be less drinking and driving in Confucianist societies even though the level of alcohol consumption is higher ($r = 0.368, p = 0.008$).

The ESRA2 survey also included a question on the safety perceived by different road users, measured on a scale of 0 to 10. The correlations of the national averages of these values with the two key cultural dimensions are shown in **Table 7**. All correlations are positive, which means that in countries that are more Independent and Confucianist, road users feel safer. The correlations for the Confucianist and Independent dimensions do not differ much; for some road users, the correlation value is even higher for Confucianist than for Independent.

Results on national differences in road safety culture are in general based on questionnaire surveys that were conducted in several countries at once. Examples of

(% of road users)	Source (# of countries)	Correlation with	
		Independent	Confucianist
Car drivers exceeding speed limits in built-up areas	ESRA (41)	0.533 (<i>p</i> < 0.001)	0.291 (<i>p</i> = 0.074)
Car drivers exceeding speed limits outside built-up areas (except motorways)	ESRA (41)	0.658 (<i>p</i> < 0.001)	0.295 (<i>p</i> = 0.062)
Car driver exceeding speed limits on motorways	ESRA (41)	0.572 (<i>p</i> < 0.001)	0.107 (<i>p</i> = 0.507)
Car drivers driving over the BAC limit	ESRA (41)	-0.283 (<i>p</i> = 0.073)	-0.322 (<i>p</i> = 0.040)
Car drivers reading text messages while driving	ESRA (40)	-0.703 (<i>p</i> < 0.001)	-0.445 (<i>p</i> = 0.004)
Cyclists cycling without a helmet	ESRA (41)	0.203 (<i>p</i> = 0.203)	0.218 (<i>p</i> = 0.171)
Rear passengers of cars wearing seat belt	WHO (32)	0.814 (<i>p</i> < 0.001)	0.552 (<i>p</i> = 0.001)
PTW riders wearing helmet	WHO (38)	0.620 (<i>p</i> < 0.001)	0.125 (<i>p</i> = 0.453)
PTW passengers wearing helmet	WHO (33)	0.618 (<i>p</i> < 0.001)	0.039 (<i>p</i> = 0.827)

Data from ESRA are based on self-reported behavior, data from WHO on observed behavior.

Table 6.
Correlations between cultural dimensions and risky behavior in traffic.

Subjective safety (SS)	Correlation with	
	Independent	Confucianist
SS of pedestrians	0.611 (<i>p</i> < 0.001)	0.592 (<i>p</i> < 0.001)
SS of cyclists	0.411 (<i>p</i> = 0.008)	0.434 (<i>p</i> = 0.005)
SS of moped riders	0.352 (<i>p</i> = 0.026)	0.413 (<i>p</i> = 0.008)
SS of motorcycle riders	0.348 (<i>p</i> = 0.028)	0.404 (<i>p</i> = 0.010)
SS of car drivers	0.531 (<i>p</i> < 0.001)	0.366 (<i>p</i> = 0.020)
SS of car passengers	0.444 (<i>p</i> = 0.004)	0.414 (<i>p</i> = 0.008)
SS of bus passengers	0.522 (<i>p</i> = 0.001)	0.620 (<i>p</i> < 0.001)

Data sources: ESRA (subjective safety), Hofstede Insights (culture).

Table 7.
Correlations between cultural dimensions and subjective safety (*N* = 40).

surveys that have been used for international comparisons are the Manchester Driver Behavior Questionnaire (DBQ) (e.g., [57]), SARTRE [58], and ESRA (e.g., [59]). Some recurring findings from such surveys are as follows:

- people are often well aware of the risks of engaging in traffic;
- females and older people engage less in risky behaviors;

- there are considerable differences between countries in terms of risky behavior in traffic, particularly in relation to drink driving, speeding and seatbelt use;
- in LMICs, people drive on average more risky and less safe than in HICs; and
- survey participants often state that certain behaviors are unacceptable but admit to engaging in these behaviors anyway.

Smaller-scale international surveys, involving a more limited number of countries, have also been conducted and confirmed such findings (e.g. [60]).

3.4 The association between culture and the road crash fatality rate

Since national culture appears to be associated with risky behavior in traffic and risky behavior is linked to the prevalence of road safety crashes, one would expect that culture is associated with the crash fatality rate. This is indeed the case. In the past, researchers have examined the relationship between several dimensions of national culture and the road fatality rate [19, 36, 44, 61–63]. In these studies, the dimensions of uncertainty avoidance, individualism, masculinity, power distance, embeddedness, and autonomy have been found to be correlated positively or negatively with the number of road traffic fatalities. It should be noted that the studies mentioned were conducted at different moments in time and used different sets of countries. The findings should, therefore, not be generalized, nor should it be assumed that all findings still hold.

In the context of my thesis [28], I analyzed the association between the two key cultural dimensions: Independent and Confucianist – which are based on more recent data than the studies referred to in the previous paragraphs – and the fatality rate per capita. The Pearson correlation between Independent and fatality rate was $r = -0.746$ ($p < 0.001$) and between Confucianist and fatality it was $r = -0.414$ ($p = 0.002$). Thus, the correlations between Independent and the fatality rate are negative and very strong; the correlation is weaker with the Confucianist dimension, but still moderate. In other words, the higher a society is ranked on the Independent and Confucianist scales, the better its road safety performance. The associations still hold when only European countries are considered; this is illustrated in **Figure 3**. Not only globally but also in Europe over 50% of the variation in fatality rate between countries can be explained by the cultural dimension Independent.

Given the strong correlations between the cultural dimensions and socio-economic indicators (see Section 2.5), one might expect that the strength of correlations would diminish when controlled for such factors. This is actually the case, as shown in **Table 8**.

For Independent, the correlation with the fatality rate remains moderately negative and statistically significant ($p = 0.001$) when controlling for gross national income (GNI) per capita. Even after controlling for the Human Development Index (HDI), with which the Independent dimension is very strongly correlated, the negative correlation is still almost statistically significant ($p = 0.076$). These results imply that in countries with a similar level of development, the more collectivist countries will tend to have higher fatality rates. An example is the difference between Denmark and the USA, with very similar levels of GNI per capita. The USA has a more collectivist culture than Denmark, and its fatality rate is more than three times as high as in Denmark (12.4 versus 4.0).

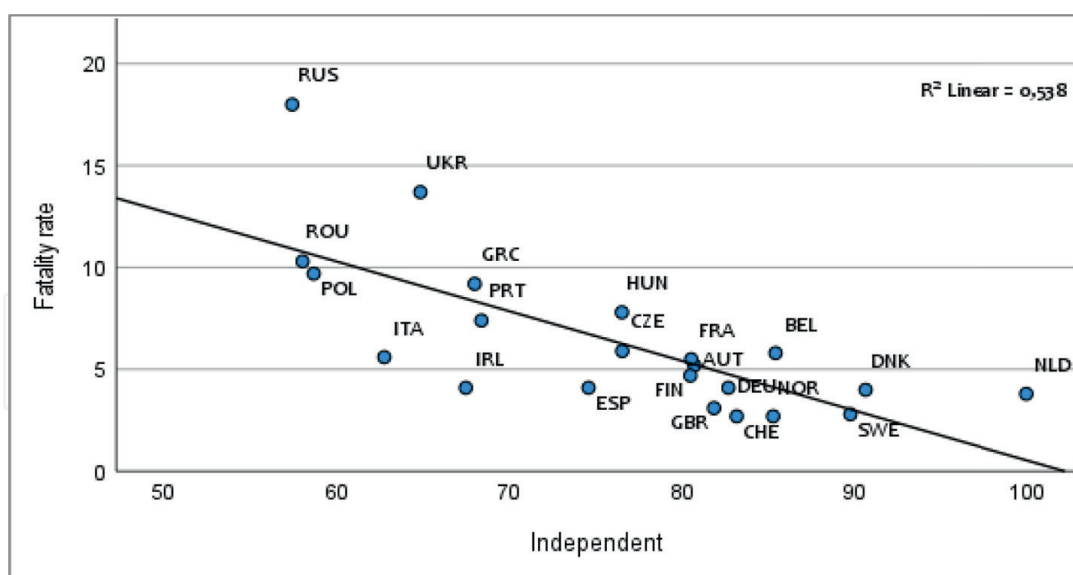


Figure 3. Fatality rate by independent (Europe only). Data sources: Hofstede insights (culture), WHO (fatality rate).

	Correlations with fatality rate		
	Zero order	Controlling for GNI	Controlling for HDI
Independent	-0.747 ($p < 0.001$)	-0.448 ($p = 0.001$)	-0.251 ($p = 0.076$)
Confucianist	-0.435 ($p = 0.001$)	-0.038 ($p = 0.789$)	0.074 ($p = 0.604$)

Data sources: Hofstede Insights (culture), WHO (fatality rate), UN (development).

Table 8. Correlations of fatality rate with cultural dimensions after controlling for GNI and HDI.

4. Support for policy measures in road safety

4.1 Policy measures considered

The ESRA2 survey included a question on support for fifteen policy measures in road safety. A Likert scale from 1 to 5 was used for collecting the responses. The question and the measures are shown in **Table 9**. When reporting on the analyses in relation to these measures, a code or short name or the code will be used; these are also included in the table.

The ESRA2 database is quite unique because it includes comparable data for 48 countries. A drawback for the cultural analysis was that ESRA2 included only one Latin-American country (Colombia). However, the ESRA1 survey, which was conducted in 2017 in 13 Latin-American countries, also included questions on public support for policy measures, several of which were (almost) identical. By using the average (small) difference between the results for ESRA2 and ESRA1 for the countries that participated in both surveys, an estimate was made for 12 Latin American countries for the measures ALC, ZEN, ZER, HEL, and NMP; these estimates were added to the dataset that was used for the analyses.

Code	Original formulation (after the intro "Do you oppose or support a legal obligation to ...")	Short formulation
ALC	Install an alcohol 'interlock' for drivers who have been caught drunk driving on more than one occasion (technology that will not let the car start if the driver's alcohol level is over the legal limit)?	<i>Alcohol interlock for recidivists</i>
ZEN	Have zero tolerance for alcohol (0,0‰) for novice drivers (license obtained less than 2 years ago)	<i>Zero alcohol novice drivers</i>
ZER	Have zero tolerance for alcohol (0,0‰) for all drivers?	<i>Zero alcohol all drivers</i>
ISA	Install intelligent speed assistance (ISA) in new cars (which automatically limits the maximum speed of the vehicle and can be turned off manually)	<i>Install ISA system</i>
SWS	Install dynamic speed warning signs (traffic control devices that are programmed to provide a message to drivers exceeding a certain speed threshold)	<i>Install Speed Warning signs</i>
SRE	Have a seatbelt reminder system for the front and back seats in new cars	<i>Seatbelt reminder all seats</i>
HEL	Require all cyclists to wear a helmet	<i>All cyclists wear helmet</i>
HEC	Require cyclists under the age of 12 to wear a helmet	<i>Children cyclists wear helmet</i>
HEP	Require all moped drivers and motorcyclists to wear a helmet	<i>PTW (powered two wheelers) wear helmet</i>
RFL	Require pedestrians to wear-reflective material when walking on the streets in the dark	<i>Pedestrians wear-reflective material</i>
RFC	Require cyclists to wear-reflective material when cycling in the dark	<i>Cyclists wear-reflective material</i>
RFP	Require moped drivers and motorcyclists to wear-reflective material when driving in the dark	<i>PTW wear-reflective material</i>
NMP	Have zero tolerance for using any type of mobile phone while driving (handheld or hands free) for all drivers	<i>No use mobile phones in cars</i>
NHP	Not use headphones (or earbuds) while walking on the streets	<i>No use headphones by cyclists</i>
NHC	Not use headphones (or earbuds) while riding a bicycle	<i>No use headphones by pedestrians</i>

Table 9.
 Exact formulation and shorter version of the 15 policy measures in ESRA2.

4.2 Level of support for policy measures in road safety

Different indicators can be used to measure the level of support for these policy measures. The conventions commonly applied in ESRA publications are to consider the respondents who gave a 4 or 5 on a scale of 1 to 5 as 'supportive.' Overall, most of the respondents tend to support the policy measures that were included in ESRA2 (see **Figure 4**). For 12 of the 15 measures, over 60% of respondents are in favor. The highest level of support (9 respondents out of 10) is for the obligation for all PTW riders to wear a helmet, a measure which is already implemented in most countries. The lowest public support, slightly below 50%, is for forbidding pedestrians to wear headphones

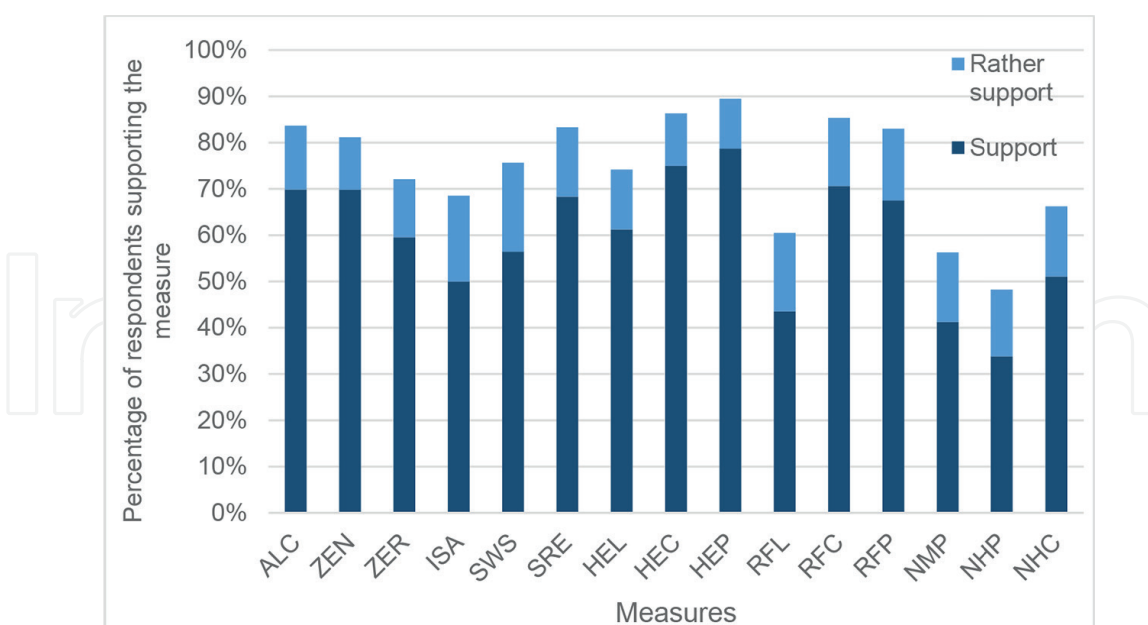


Figure 4. Percentage of “full support” and “rather support” of the 15 ESRA2 measures. Data source: ESRA.

or earbuds when walking in the streets. One could also take a stricter approach and only include those who gave the highest score; then the percentage of supporters would decrease. However, as illustrated in **Figure 4**, the overall pattern remains very similar, and most measures are still supported by over half of the sample.

4.3 The relation between national culture and support for measures

Table 10 shows the correlation between the percentage of the population supporting the fifteen measures and the cultural dimensions: Independent and Confucianist. For eight measures, there is a strong negative correlation with Independent: two measures related to alcohol (ALC and ZER), the two speeding-related measures (ISA and SWS), two distraction-related measures (NMP, NHC), SRE, and HEL. Thus, the more the autonomous thinking in a society, the higher the opposition against policy measures, in particular those that are perceived to restrict freedom of action.

The correlations of Independent with the six other measures are negative but not statistically significant at the $p < 0.05$ level. These measures include the three ones concerning reflective clothing, zero alcohol for novice drivers and helmet wearing by children cyclists and PTWs. At least for these measures, national culture is *not* a good predictor for the level of support.

Twelve measures are moderately or strongly negatively correlated with Confucianist. For most of these, the strength of the association is weaker than with the Independent dimension, except when it comes to measures which could be perceived as paternalistic, such as having to wear helmets or reflective clothing.

Overall, these results illustrate that for many types of governmental interventions in road safety, dimensions of national culture can be a strong predictor of the public support for these measures. The Independent dimension is often a strong predictor of resistance to policy measures. Yet, there are policy measures and interventions, for which national culture does not appear to be linked to the level of support. This applies for most measures for which public support is very high.

Measure		N	Corr. with Independent	Corr. with Confucianist
ALC	Alcohol interlock for recidivists	41	-0,503**	-0,321*
ZEN	Zero alcohol novice drivers	40	-0.192	-0,396*
ZER	Zero alcohol all drivers	41	-0,673**	-0,519**
ISA	Install ISA system	35	-0,801**	-0,403*
SWS	Install Speed Warning signs	34	-0,847**	-0,576**
SRE	Seatbelt reminder all seats	34	-0,612**	-0,500**
HEL	All cyclists wear helmet	41	-0,576**	-0,691**
HEC	Children cyclists wear helmet	34	-0.172	-0,524**
HEP	PTW wear helmet	34	-0.177	-0.286
RFL	Pedestrians wear-reflective material	35	-0.026	-0.051
RFC	Cyclists wear-reflective material	34	-0.211	-0,379*
RFP	PTW wear-reflective material	34	-0.198	-0,393*
NMP	No use mobile phones in cars	40	-0,584**	-0,520**
NHP	No use headphones by pedestrians	34	-0,740**	-0,434*
NHC	No use headphones by cyclists	34	-0,362*	-0.234

Data sources: ESRA (measures), Hofstede Insights (culture).

*: $p < 0.05$; **: $p < 0.01$.

Table 10.
 Correlations between support for policy measures and the cultural dimensions: Independent and Confucianist.

4.4 The relation between culture, fatality rate, and support for measures

Given the associations between culture, development, and fatality rate, one might expect the strength of the association between national culture and support for policy measures to diminish after controlling for fatality rate. **Table 11** shows the correlations of the Independent and Confucianist dimensions with support for measures, when controlled for fatality rate. The strength of association indeed decreases, but for several measures, the partial correlations are still high and statistically significant. For the Independent dimension, the typical decrease of the correlation coefficient is about 0.3; for Confucianist, it is smaller. The findings on the partial correlations mean that when comparing countries with similar fatality rates, the opposition to policy measures, in particular those that restrain individuals' behavior, will often be higher in the more Independent and Confucianist countries.

4.5 An example – Public support for use of ISA systems in cars

To illustrate national and cultural differences in public support for measures, let us consider the 'ISA measure' in ESRA2. The question in the ESRA survey asked the respondents whether they would support a legal obligation to install intelligent speed assistance (ISA) systems in new cars. **Figure 5** shows that support for ISA varies considerably across cultural clusters: the values are lowest in the Anglo world, Germanic, and Nordic Europe; the highest support is found in Sub-Saharan Africa and the Middle East.

	Correlation Independent and support for measures	Correlation after controlling for fatality rate	Correlation Confucianist and support for measures	Correlation after controlling for fatality rate
Alcohol interlock for recidivists	-0,503**	-0.221	-0,321*	-0.143
Zero alcohol novice drivers			-0,396*	-0.363*
Zero alcohol all drivers	-0,673**	-0.487**	-0,519**	-0.387*
Install ISA system	-0,801**	-0.544**	-0,403*	-0.151
Install Speed Warning signs	-0,847**	-0.636**	-0,576**	-0.444**
Seatbelt reminder all seats	-0,612**	-0.210	-0,500**	-0.327
All cyclists wear helmet	-0,576**	-0.312*	-0,691**	-0.611**
Children cyclists wear helmet			-0,524**	-0.517**
Cyclists wear-reflective material			-0,379*	-0.359*
PTW wear-reflective material			-0,393*	-0.378*
No use mobile phones in cars	-0,584**	-0.259	-0,520**	-0.373*
No use headphones by pedestrians	-0,740**	-0.433*	-0,434*	-0.214
No use headphones by cyclists	-0,362*	-0.155		
<i>Data sources: ESRA (measures), Hofstede Insights (culture).</i>				
*: $p < 0.05$; **: $p < 0.01$.				

Table 11. Correlation between the cultural dimensions and support for measures, without and with controlling for fatality rate.

Table 10 already shows that the support for ISA is (very) strongly associated with the two key dimensions of national culture: Independent ($r = -0.801^{**}$) and Confucianist ($r = -0.403^*$). **Figure 6** is a scatterplot of the relationship between the support for ISA and the Independent dimension.

It is noteworthy that 64% of the variation between countries can be statistically explained by the cultural variable Independent. The figure shows that the highest level of support is found in LMICs, in which there is often a high collectivist culture. But even after exclusion of such countries, the strong negative correlation between Independent and resistance to ISA persists. In other words, the more autonomous

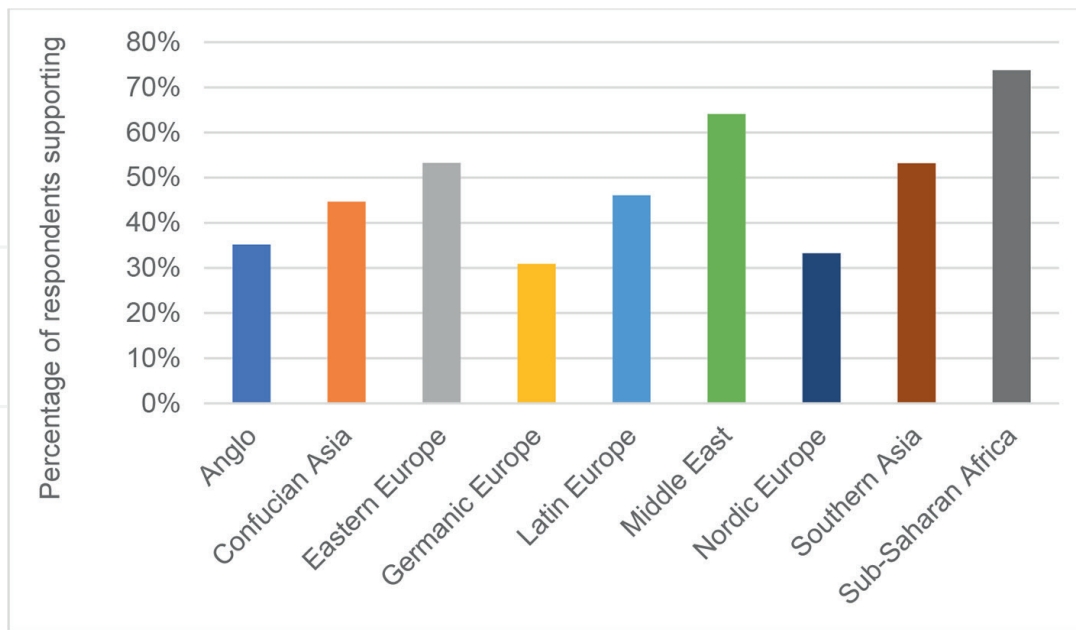


Figure 5.
 Support for ISA by cultural cluster. Data source: ESRA.

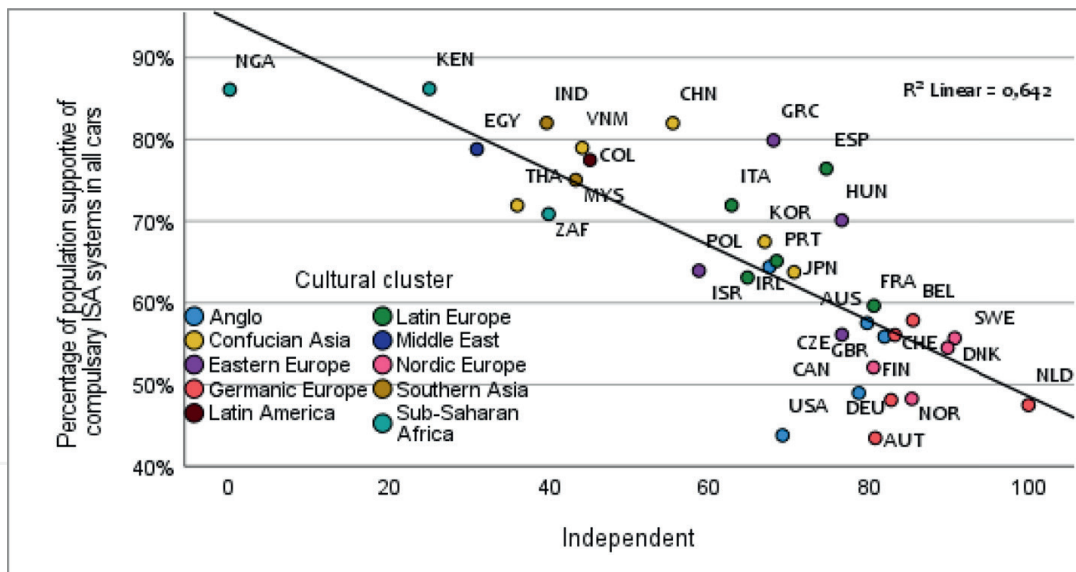


Figure 6.
 Support for ISA by independent cultural dimension. Data sources: ESRA (support for ISA) and Hofstede insights (culture).

thinking is highly valued within a country, the higher the opposition against measures like ISA, which are believed to restrict autonomous decision making – in this case about speed choice.

5. Conclusion

This chapter discussed the relationship between national culture, road safety performance, and public support for policy measures. The analyses of the fatality rates and the operationalization of national culture showed that these phenomena are

strongly associated with human development. Key findings include the differences between HICs and LMICs, the lower fatality rates in more individualistic countries, and the very strong relationship between the cultural dimension ‘Independent’ and indicators for human development and equality.

The findings on road safety performance and national culture provided the context for an analysis of the level of support for the fifteen policy measures that were included in the ESRA2 survey. In general, people of LMICs are more supportive of policy measures in road safety than those of HICs. Low fatality rates and the feeling that the roads are safe are factors associated with lower support for additional measures in road safety. The analyses also illustrate that for several types of road safety measures, national culture can be a good predictor of public support. The Independent dimension is often a strong predictor of resistance to policy measures, in particular in relation to speeding. Yet, for some measures, national culture does not appear to be linked to the level of support.

With this research, the associations between public support, culture, countries, and road safety performance have become understood better. Not only several findings from the literature were confirmed but also many new insights were gained. Much remains to be done, however, to understand better these associations and to contribute to better policy making in the field of road safety. It was beyond the scope of the study to develop a theoretical model with cause–effect relationships for public support, but elements to create such models have been identified and are a solid basis for further research. Of particular importance will be gaining a better understanding of factors causing differences between road safety performance between low-, middle-, and high-income countries. The cultural differences between these countries impact on behavior in traffic and, hence, on the fatality rate, while the economic difference determines the capability to implement (expensive) measures. The combined effects of these differences lead to quite different “road safety contexts,” in which some of the models and concepts traditionally used in road safety thinking, developed in the Western world, become less appropriate.

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