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Is there more to international Diffusion than Culture? An investigation on the Role of Marketing and Industry Variables

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Abstract:

Companies employ international diffusion models to assess the local market potential and local diffusion speed to support their decision making on market entry. After their entry into a country, they use the model forecasts for their performance controlling. To this end, empirical applications of international diffusion models aim to link differential diffusion patterns across countries to various exogenous drivers. In the literature, macro- and socioeconomic variables like population characteristics, culture, economic development, etc. have been linked to differential penetration developments across countries. But as companies cannot influence these drivers, their marketing decisions that shape national diffusion patterns are ignored. Is this reasonable? What then, is the role of marketing instruments in an international diffusion context? We address this issue and compare the influence of these prominent exogenous drivers of international diffusion with that of industry and marketing-mix variables. To account for all of these factors and simultaneously accommodate the influence of varying cross-country interactions, we develop a more flexible yet parsimonious model of international diffusion. Finally, to avoid technical issues in implementing spatially dependent error terms we introduce the test concept of Moran's I to international diffusion model. We demonstrate that the lead-lag effect in conjunction with spatial neighborhood effects controls most of the spatial autocorrelation. Using this combined approach we find that --- for cellulars --- industry and marketing-mix variables explain international diffusion patterns better than macro- and socioeconomic drivers.

1. Introduction

The global economy leads to an increasing international competition, fostering more innovations in shorter life cycles that companies seek to introduce in local markets across the world. For their rollout strategy, companies follow either a waterfall or sprinkler strategy (e.g., Kalish et al. 1995, Libai et al. 2005, Stremersch and Tellis 2004). In either approach, companies have to decide on which countries to enter. After their entry into a country, they need to control their respective performance. To this end, studies of international diffusion analyze the penetration patterns of many innovations across countries. In their analysis, most studies are linking the differences of diffusion patterns across countries to exogenous drivers. Most of these drivers are macro- or socioeconomic variables, like income per capita, population characteristics or cultural aspects (e.g., Dekimpe et al. 2000c). Even though some of these drivers have been confirmed in various studies to explain substantial variance across countries, these are actually variables that managers cannot influence. Accordingly, their local marketing decisions shaping the local diffusion process are generally ignored, rendering the models use for performance controlling substantially reduced. But is this reasonable? Are people and markets really that different after all - or is it a myth as, e.g., Farley and Lehmann (1994) ask? What then, is the role of the marketing manager's natural toolkit, the marketing-mix? On the national level, these variables have been shown to shape the diffusion process (e.g., Bass et al. 1994). But on the international level, the marketing-mix has been mostly neglected in diffusion research (e.g., Dekimpe et al. 2000c, Meade and Islam 2006). A major reason may be the missing data problem. Although four studies include a few selected marketing variables on the international diffusion of drugs, movies or cellulars (Desiraju et al. 2004, Elberse and Eliashberg 2003, Islam et al. 2002, Neelamegham and

Chintagunta 1999), none actually compares their influence systematically with the macro- or socioeconomic variables. If it could be shown that managers shape international diffusion processes with their marketing decisions, the model forecast's sensible use for performance controlling could be established.

Another important issue when deciding on market entry and or controlling international performance is related to cross-country interactions. Recently, various researchers have shown that --- at least statistically --- spillover effects are present. The spillover from the lead to lagging countries is called the lead-lag or learning effect (e.g., Takada and Jain 1991, Ganesh et al. 1997). This effect links a single lead country with many lagging countries on the time dimension. Given the existence of this effect, managers may exploit this effect when deciding on their international roll-out strategy and marketing plans. Lately researchers allow more flexible mechanisms of cross-country influence, e.g. Putsis et al. (1997), Kumar and Krishnan (2002) and Albuquerque et al. (2007). Taken together, the studies claim the existence of (asymmetric) cross-country influences. According to these studies, not accounting for their existence in the international diffusion of innovations may result in suboptimal entry and marketing-mix decisions. Unfortunately, all of these approaches have been implemented only for a restricted number of spatial units. For larger data sets and variable types of country interactions, we still need an alternative framework. Additionally, their presence has hardly been investigated in conjunction with marketing-mix and industry variables. Hence, it is not yet obvious whether they are an artifact stemming from unobserved similar regional marketing strategies or whether cross-country interactions between local adopter populations indeed exist.

Apart from assessing cross-country influences for better strategy and marketing decisions, we need means for testing and removing spatial autocorrelation (AC) for international diffusion models, as neglecting spatial AC may lead to a serious bias in parameter estimates (Dekimpe et al. 2000c). But biased parameter estimates may also lead to wrong conclusions in entry strategy and marketing-mix decisions. Albuquerque et al. (2007) introduce a test on the basis of a spatial error correlation matrix, but this approach may encounter technical difficulties for a large number of spatial units which have a low number of neighbors. Accordingly, we need to complement the existing approaches with an alternative route to assess and reduce spatial AC in international diffusion models.

Summarizing, we contribute to the existing literature in several ways. First, we investigate the role of marketing and industry variables empirically in an international diffusion context, comparing their influence to the most prominent confirmed drivers from the extant literature. Second, we propose an alternative framework based on the Generalized Bass Model (GBM, Bass et al. 1994) that accommodates important cross-country influences and drivers of international diffusion in a parsimonious way. Third, we introduce the concept of Moran's I to international diffusion modeling to test on the presence of spatial autocorrelation. Fourth, industry and marketing-mix variables explain the international diffusion of cellulars better than macro- and socioeconomic drivers. Although we demonstrate that --- at least in our case --- most of the spatial AC may be controlled for by specifying cross-country interaction effects, regional spillovers evaporate in international diffusion models when industry and marketing-mix variables are accounted for.

The balance of the paper continues with a literature review on international diffusion modeling in §2. We derive the model in §3. In §4, we present the data of our application and briefly describe our estimation approach. The diagnostics and empirical results are discussed in §5. We conclude with a summary in §6.

2. Literature Review[1]

We structure our review of the extant literature according to our research propositions. Beginning with an overview on the drivers of international diffusion processes, we continue to describe the various modeling approaches and their results on country interactions. Technical issues like testing for spatial dependence are addressed in the estimation section.

Drivers of international Diffusion Processes

We identify 37 empirical studies that investigate drivers of international diffusion processes (cf. table 1, Peters and Kumar 2008). Most of the studies focus on a limited number of determinants. The most comprehensive approaches are represented by Helsen et al. (1993) and Tellis et al. (2003). Following the structure from Peters and Kumar (2008), we will refer to their extended World Bank classification of macro- and socioeconomic drivers to structure the collective findings.

The drivers may shape different aspects of the international diffusion process (e.g., across-country diffusion, within-country diffusion or takeoff). Our study investigates the role of marketing and industry variables in comparison to exogenous drivers of within-country diffusion processes. Accordingly, we focus our review here on the elements of within-country diffusion speed. We additionally cover the findings on the local market potential representing the upper diffusion ceiling and those on cross-country interactions, as these elements moderate the diffusion speed parameters.

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1 We limit our review of the extant literature to contributions in qualified journals (cf. Peters and Kumar 2008 for a listing and qualification of corresponding contributions in international diffusion modeling).

Table 1. Overview on international diffusion studies

Authors	*Explanation of Parameters through Determinants*						*Type of Determinants*				
	General Growth Parameter	*Coefficient of Innovation (p)*	*Coefficient of Imitation (q)*	*Market Potential (m)*	*Learning / Lead-Lag Parameter*	*Mixing / Transition / Takeoff Parameter*	*# Determinants*	*Time- / Space-Penetration*	*Factors*	*Index*	*Countries covered*
Poznanski (1983)							N	(T)			19
Antonelli (1986)	X				(X)		6	T			16
Gatignon et al. (1989)		X	X				3 (10)	--	2 (6,3)		14
Takada and Jain (1991)			X				1	T			4
Helsen et al. (1993)		X	X				6 (23)	T	6 (3,3,3,2,7,5)		12
Mansfield (1993)	X				(X)		2	T			6
Lücke (1993)	X						1	T			61
Mahajan and Muller (1994)			X				N				16
Ganesh and Kumar (1996)							1	PL			10
Ganesh et al. (1997)					X		3 (11)	T D		2 (4,3)	16
Putsis et al. (1997)		X	X				2	PC			10
Dekimpe et al. (1998)		X	X	X			9	PG AC			184
Kumar et al. (1998)		X	X				10	T	2 (6,3)		14
Gruber (1998)	X						6	T			12
Tellefsen and Takada (1999)		X	X				4				16
Neelamegham and Chintagunta (1999)	(X)						9	T PL			14
Dekimpe et al. (2000a)						X	9	T PG			184
Dekimpe et al. (2000b)						X	4	T			162
Caselli and Coleman (2001)	(X)						12	T R			89
Gruber and Verboven (2001a)		X	X				7	T			15
Gruber and Verboven (2001b)		X	X				9	T			140
Keller (2002)							5	D			14
Islam et al. (2002)		X	X				4				41
Kumar and Krishnan (2002)			(X)			X	8	(T) PC	2 (3,4)		7
Talukdar et al. (2002)		X	X	X			17	T			31
Elberse and Eliashberg (2003)							17	T PL			5
Tellis et al. (2003)						X	23	T R PL	3 (7,3,2)	1 (4)	16
van Everdingen and Waarts (2003)							9				10
Van den Bulte and Stremersch (2004)							30(+7)	T			28
Desiraju et al. (2004)			X				7				15
Stremersch and Tellis (2004)	X					X	8	T		1 (3)	16
Dwyer et al. (2005)			X				5				13
van Everdingen et al. (2005)								PC			15
Perkins and Neumayer (2005)						X	11	PG			147
Crenshaw and Robison (2006)	X						10				80
Albuquerque et al. (2007)		X	X	X			4 (8)	PC			56
Chandrasekaran and Tellis (2008)						X	12	T	2		27
Our study		*(X)*	*(X)*	*X*	*(X)*		*103*	*T PG*	*3,4,4(25,46,16)*	*2 (3,5)*	*183*

X specified — *AC* *Adopting Countries* — *R* *Regional Dummies* — *PC* *Penetration of Countries*
(X) specified for some — *D* *Distance* — *T* *Time Lag* — *PG* *Penetration in Group of Countries*
PL *Penetration Lead Country*

Drivers of within-country diffusion speed. When deciding on the international entry strategy, local diffusion speed is an important criterion. Faster diffusion speeds may allow faster return on the investments, even if the company realizes just a share of the market volume. With respect to the within-country diffusion speed, we aggregate the findings across the growth, coefficient of innovation and imitation parameters in table 1. As we will show, most findings on the influence of specific macro- or socio-economic drivers on diffusion speed are inconclusive, i.e., they either have alternating directions or influence various components of diffusion speed across international diffusion studies. These effects may be a result of the high correlations between the various macro- and socio-economic drivers. Another issue reflects on the interpretation of assessed correlations between these drivers and the penetration levels across countries. Although these correlations are found to be significant it should not necessarily imply a causal relationship.

The first World Bank category of variables comprises population related indicators on demographics, labor, education, health and culture. On demographics, various studies investigate the influence of the population size, population growth rate or density on the local speed of diffusion. Dekimpe et al. (1998) find population growth positively associated with the diffusion speed of cellulars, whereas Chandrasekaran and Tellis (2008) find population density to be non-significant for time-to-takeoff. The number of ethnic groups within the population has a negative correlation with the speed of diffusion across many innovations, one argument being the lower degree of population homogeneity that may inhibit a rapid imitation effect (e.g., Dekimpe at al. 1998, 2000b, Talukdar et al. 2002). The crude death rate has a negative relation with diffusion speed (Dekimpe et al. 1998).

With respect to labor related variables, the percentage of women in the labor force has been investigated. Gatignon et al. (1989) as well as Kumar et al. (1998) find a higher percentage to be positively associated with higher diffusion speed. Talukdar et al. (2002) for diffusion speed and Tellis et al. (2003) for time-to-takeoff cannot confirm this postulated influence.

The effect of education indicators on diffusion speed has been studied to some extent, and all authors assume higher levels of education to have a positive relationship with speed. However, the results are mixed. Talukdar et al. (2002) find a negative correlation of higher illiteracy rates in the population, Caselli and Coleman (2001) find a positive one of higher ratios in higher education levels. On the other hand, some studies do not find a significant relationship (e.g., Albuquerque et al. 2007, Helsen et al. 1993, Tellis et al. 2003).

The few findings on the impact of health specific variables are mixed as well, e.g., Helsen et al. (1993) find a factor constructed on health variables --- containing variables like life expectancy or physicians p.c. --- to be positively associated with the speed related to the innovative component, but negatively to the imitative speed component. For the diffusion of drugs a higher health care spending is significantly associated with the diffusion speed (Desiraju et al. 2004).

The last subcategory comprises variables on culture, lifestyle, language and religion. For culture, there are two internationally extensively employed scales. The first by Hofstede (2001) comprises five constructs, namely uncertainty avoidance, individualism, power distance, masculinity and long-term orientation, while the second based on Hall’s research (1976) consists of the context of culture and its monochronism. The hypothesis of negative association of uncertainty avoidance with speed has only been confirmed by van Everdingen and Waarts (2003), which Dwyer et al. (2005) as well as Stremersch and Tellis (2004) cannot confirm. Also with respect to time-to-takeoff this measure yields non-significant results (e.g., Tellis et al. 2003, Chandrasekaran and Tellis 2008). Van den Bulte and Stremersch (2004) find a negative relationship with the ratio of imitation to innovation speed components. Individualism is found to have a positive relation early on (van Everdingen and Waarts 2003; also Chandrasekaran and Tellis (2008) on time-to-takeoff) and negative later in the diffusion process (e.g., Dwyer at al. 2005). Stremersch and Tellis (2004) find no effect on the growth rate. The findings on the construct of power distance are also mixed. Van Everdingen and Waarts (2003) find it to have a positive relation with speed. But Dwyer et al. (2005) report a negative association. Stremersch and Tellis (2004) as well as Chandrasekaran and Tellis (2008) find no relation with the growth rate and time-to-takeoff respectively. Except for the latter source, the same pattern holds for masculinity. The last Hofstede measure, long-term orientation, is positively associated with speed by van Everdingen and Waarts (2003), but negatively by Dwyer et al. (2005). On the Hall measures, results are inconclusive as well, e.g., van Everdingen and Waarts (2003) find a positive association of lower context cultures with speed, whereas Takada and Jain (1991) find the reverse impact. Other cultural criteria, like the Globe measures or the percentage of protestants in the population representing achievement have no correlation with time-to-takeoff (e.g., Tellis et al. 2003, Stremersch and Tellis 2004, Chandresekaran and Tellis 2008).

No study investigates the effect of religion on the international diffusion even though Dekimpe et al. (2000c) propose such an approach. Finally, the factor cosmopolitanism has been investigated by Gatignon et al. (1989), Helsen et al. (1993) and Kumar et al. (1998). All of them find an alternating positive and negative relationship between its impact on the innovative and imitative component of diffusion speed.

The second World Bank group of indicators consists of environmental indicators. Here, energy production and consumption items have been subsumed into factors of either mobility or lifestyle with mixed or insignificant results on diffusion speed. Only Chandrasekaran and Tellis (2008) find electricity consumption --- as part of a wealth factor --- related to a shorter time-to-takeoff. For urbanization, a higher number of larger cities correlates with lower innovation, but higher imitation speed (Dekimpe et al. 1998), whereas a higher population share of the largest city is positively associated with the growth rate (Crenshaw and Robison 2006). In contrast, Albuquerque et al. (2007) do not find a significant association for the percentage of urban population with diffusion speed.

The third group comprises macro-economic and political indicators, like GDP and its structure, trade volumes and political system characterizations. Generally, a higher GDP (per capita) is postulated as having a positive relation with diffusion speed. This is confirmed across many studies, e.g., Caselli and Coleman (2001), Crenshaw and Robison (2006), Dwyer et al. (2005), Gruber and Verboven (2001a,b), Islam et al. (2002) and Putsis et al. (1997). The same effect holds for speed-related studies on time-to-takeoff (Stremersch and Tellis 2004, Tellis et al. 2003, Chandrasekaran and Tellis 2008). With respect to the income distribution, results are mostly non-significant (e.g., Stremersch and Tellis 2004, Tellis et al. 2003 and Chandrasekaran and Tellis 2008). Exceptions are Talukdar et al. (2002), who find an unexpected slightly positive relation of higher inequality with imitation, and Van den Bulte and Stremersch (2004), who find a positive association with the imitation to innovation speed component ratio. The postulated correlation of trade on international diffusion speed is positive. However, the results are mixed. Helsen et al. (1993) find a negative association with the innovation component of speed, but a positive with the imitation one. Talukdar et al. (2002) do not find any effect on speed, which compares with Tellis et al. (2003) and Chandrasekaran and Tellis (2008) for time-to-takeoff. Perkins and Neumayer (2005), Crenshaw and Robison (2006) and Gruber (1998) find a positive correlation of trade with speed as postulated. Keller (2002) and Albuquerque et al. (2007) find a positive relation of speed between countries with bilateral trade relations for business innovations.

With respect to the political situation selected variables have been studied occasionally. Most of the variables have a non-significant (e.g., Dekimpe et al. 1998, Crenshaw and Robison 2006, Tellis et al. 2003) or mixed (e.g., Helsen et al. 1993) relation with the two components of diffusion speed.

The fourth group of World Bank indicators consists of industry specific variables, like transport, power and communication sector or information and technology variables. Many variables have been investigated, although they have mostly been aggregated into factors. Accordingly, given the large variety of aspects covered, results on their correlation with diffusion speed are mixed. Gatignon et al. (1989), Helsen et al. (1993) and Kumar et al. (1998) all specify a mobility factor that consists of items like number of cars, air passenger mileage, etc. Helsen et al. (1993) find a negative association of mobility with diffusion speed. Gatignon et al. (1989) and Kumar et al. (1998) both find this --- in some aspects differently specified --- factor to have product specific alternating positive and negative correlation with either the innovation or imitation component. Tellis et al. (2003) find no relation of the number of cars p.c. with the time-to-takeoff. With respect to communication sector variables, the number of telephone mainlines has often been investigated in the context of cellular diffusion. Surprisingly, Gruber and Verboven (2001a) find a negative correlation with diffusion speed, whereas Gruber and Verboven (2001b) assess a positive one, although less so over time. Crenshaw and Robison

(2006) find no association of mainline penetration for internet host diffusion. In contrast, both findings on the relation of digital technology with cellular diffusion speed are positive (Gruber and Verboven 2001a,b).

The second subcategory concerning information and technology is of particular interest to international diffusion modeling, as it is widely assumed that a higher penetration of (mass) communication devices helps spreading the message on innovations. But again, results on their correlation with international diffusion speed are mixed. Putsis et al. (1997) and Tellefsen and Takada (1999) find a positive relation of the TV ownership ratio with the innovative component of diffusion speed. For other products and media gadgets, however, Tellefsen and Takada (1999) themselves as well as Talukdar et al. (2002), Tellis et al. (2003) and Stremersch and Tellis (2004) cannot confirm this effect.

The fifth World Bank group of variables, "Global Links", comprises international investment, developmental aid, labor migration and tourism items. Only the last subgroup of variables has been investigated in the studies reviewed here, and mostly these variables have been made part of factors on cosmopolitanism that we covered earlier.

We borrow four extensions to the World Bank classification from Peters and Kumar (2008), namely market structure variables, industry and product related variables, diffusion related and spatial variables. The group on market structure variables yields expected results. All studies find competition to have a positive correlation with the speed of diffusion (Dekimpe et al. 1998 on the innovative speed component, Desiraju et al. 2004, Gruber and Verboven 2001b). An installed base slows diffusion speed down (e.g., Dekimpe et al. 2000b, Perkins and Neumayer 2005).

With respect to industry and product related variables, Mansfield (1993) finds an expected positive relation of the expected internal rate of return with diffusion speed for industrial innovations. The presence of technical industry standards is positively correlated with the imitation to innovation speed component ratio (Van den Bulte and Stremersch 2004). The type of product has an influence on diffusion speed, too. Stremersch and Tellis (2004) find white goods to be associated with longer growth cycles. Chandrasekaran and Tellis (2008) find fun products to takeoff faster compared to work products for consumers. Most of the product related variables have been investigated for the movie industry, e.g., by Neelamegham and Chintagunta (1999) and Elberse and Eliashberg (2003). Both find certain genres, production budgets or star power to be positively associated with the international diffusion of movies. A higher advertising budget also correlates with faster diffusion rates for movies (Elberse and Eliashberg 2003), whereas the findings on movie distribution structures are mixed across both studies. The effect of price on diffusion speed has been investigated by Desiraju et al. (2004) for drugs, where no significant effect has been found. Islam et al. (2002) find mixed effects across price components for cellulars over time, given a relatively small and short data set.

Diffusion related variables are based on the number of adopters or the time passed since the introduction of innovation, i.e., the lead-lag or learning effect. Dekimpe et al. (1998) find no correlation of the number of previously adopting countries or the number of similar adopting countries with diffusion speed. Ganesh and Kumar (1996) find a positive association of the number of adopters in the U.S. with the imitation speed of later adopting countries. This effect is confirmed by Islam et al. (2002), Elberse and Eliashberg (2003) as well as Crenshaw and Robison (2006). Tellis et al. (2003) and Chandrasekaran and Tellis (2008) both find the number of previous takeoffs to be associated with faster takeoffs later. As stated earlier, most studies find a positive correlation of the lead-lag or learning effect with the diffusion in lagging countries (e.g., Takada and Jain 1991, Kumar et al. 1998, Dekimpe et al. 2000b, Gruber and Verboven 2001a,b, Kumar and Krishnan 2002, Perkins and Neumayer 2005; Chandrasekaran and Tellis 2008 for time-to-takeoff). Helsen et al. (1993) find a positive association with the innovation speed component, but negative one with the imitative one, whereas Talukdar et al. (2002) find the reverse pattern. Neelamgeham and Chintagunta (1999) find a negative correlation of the lead-lag effect with speed for movies, but given the special nature of the product this seems intuitive.

With spatial variables we conclude our review on determinants of international diffusion speed. Caselli and Coleman (2001) find regional dummies based on continents to have different directions of correlation. Keller (2002) finds that the penetration of a business innovation is lower with increasing distance to the innovative center. Perkins and Neumayer (2005) and Albuquerque et al. (2007) confirm this distance effect.

Summarizing, the literature provides a very heterogeneous picture on drivers of differential diffusion speeds across countries, which may be owned to their high cross-correlations. As Dekimpe et al. (2000c) and Kumar (2003) state, we still need a more holistic approach and a more consistent variable specification to infer generalizations from the body of literature. Especially the international diffusion studies that incorporate marketing-mix variables are sparse and focus on very particular markets like drugs and movies. Our study addresses this gap, including a range of industry and marketing-mix variables in an international diffusion model and comparing their influence with the most prominent exogenous drivers of within-country diffusion speed.

Table 2. Empirical Findings on Price in Diffusion Models

Authors	on Diffusion Speed (S)	on Market Potential (MP)	Finding	Model Type	Level of Diffusion Model	Product Type	Country	Other Marketing-Mix Variable	on Speed (S) or Market Potential (MP)
	Specification of Price in Diffusion Models								
Bass (1980)		X	sig.	Extended BM	C	6 Consumer Durables	US		
Kalish and Lilien (1983)		X	sig.	extended BM	C	1 Consumer Durable	US	Adv Qual	S
Kalish (1985)	 (X) 	X X	 sig., MP best 	Own Model Robinson and Lakhani (1975) Mahajan and Peterson (1978)	C	1 Consumer Durable	US		
Kamakura and Balasubramaniam (1988)	(X)	X	S best, sig.	Various Models	C	6 Consumer Durables	US		
Horsky (1990)		X	sig.	extended BM	C	4 Consumer Durables	US	Quality	MP
Jain and Rao (1990)	X	X	S, but mixed	extended BM	C	4 Consumer Durables	US		
Bhargava et al. (1991)	(X)	X	MP best MP best	Jain and Rao (1990) 4 extended BM	C	4 Consumer Durables 1 Consumer Durable	US India		
Parker (1992)	X		sig.	extended BM	C	17 Consumer Durables	US		
Weerahandi and Dalal (1992)	X		sig.	extended BM	C	1 TelCo Service (Fax)	US		
Bass et al. (1994)	X		sig.	GBM	C	3 Consumer Durables	US	Adv	S
Parker and Gatignon (1996)	(X)		sig.	extended BM	B	1 Consumer FMCG	US	Adv	S
Bottomley and Fildes (1998)	(X)	X	if, then S	12 internal/external/both see Kamakura and Balasubramaniam (1988)	C	6 Consumer Durables 6 Consumer Durables	UK US		
Danaher et al. (2001)	X		sig.	GBM PH	C	1 TelCo Service (Cellular)	EU		
Islam et al. (2002)	X		partly sig.	BM Gompertz	C	1 TelCo Service (Cellular)	16 countries		
Berndt et al. (2003)		X	sig.	BM Gompertz	B	1 Drug	US	Quality Adv	MP
Desiraju et al. (2004)	X		not sig.	Extended Logistic	C	1 Drug	15 countries		
Roberts at al. (2005)		X	sig.	BM; DFM	B	1 TelCo Service	AUS	Attitude	MP
Niu (2006)		X	sig.	SBM_{EH} $PDM\text{-}F_{EH}$	C	1 Consumer Durable	US	Adv	MP

(X) Multiplicative specification on both, S and MP, although literature attributes this as S-specification
BM Bass Model; GBM Generalized BM; DFM Dynamic Flow Model; PH Proportional Hazard; SBM_{EH} Stichastic BM (EH-Expected History); $PDM\text{-}F_{EH}$ Full Piecewise-Diffusion Model; C Category; B Brand Level

Drivers of market potential. For the international roll-out decision the local market potential is another crucial piece of information. It represents the upper penetration ceiling for each country and period. All equal, larger market potentials are more attractive as investments may be amortized faster than in smaller markets. Again, we review the collective findings along the same World Bank variable structure as above: Albuquerque et al. (2007) find the static population size of the year 2000 to have a positive relation with the penetration ceiling for the ISO 9000 standard, but to have no impact on the ISO 14000 diffusion ceiling. Dekimpe et al. (1998) find a negative correlation of the annual population growth rate for cellulars. The number of ethnic groups, representing adopter heterogeneity, and the crude death rate have no association with the market potential. For variables on labor and education, both studies, Talukdar et al. (2002) for the dependency ratio and Albuquerque et al. (2007) for the standardized literacy rates of the year 1997, find no relation with the diffusion ceiling. With respect to environmental variables, Albuquerque et al. (2007) report differences of land use across countries and the percentage of urban population not correlating with the market potential. The latter finding stands in contrast to Talukdar et al. (2002), who report a positive relation of the urban population ratio with the market potential for consumer innovations. Their result is underlined by Dekimpe et al. (1998), where the number of major population centers has a positive correlation with the market potential for consumer innovations. On macro-economic variables, Dekimpe et al. (1998) as well as Talukdar et al. (2002) find a positive relation of GDP per capita with the diffusion ceiling. Albuquerque et al.'s (2007) non-significant finding of the 1997 GDP per capita may be owned to the business nature of their innovations. With respect to income distribution Talukdar et al. (2002) report no influence, while the trade to GDP ratio has a positive association with the diffusion ceiling. Dekimpe et al. (1998) find that earlier communist countries have no lower or higher ceiling than other countries. For variables on markets, Talukdar et al. (2002) do not find any correlation of waiting lists, TV and telephone mainline penetrations with the market potential of various innovations. For cellulars, the number of competing system standards is positively associated with the diffusion ceiling (Dekimpe et al. 1998), but neither the number of previously adopting countries nor the proportion of countries adopting in the same World Bank classification are.

Summarizing, also findings on the drivers of the diffusion ceiling in an international context are sparse and to some extent inconclusive. Across studies, the population size, income levels as well as trade levels may have some correlation with the market potential based on the studies above, but it is striking that (relative) prices and product characteristics have not been investigated. Since Robinson and Lakhani (1975) incorporated price into diffusion models, previous empirical investigations confirm its significant correlation on the national level, either with the speed of diffusion or the diffusion ceiling (cf. table 2). This finding holds across various model specifications and innovations, as well on the brand as on the category level. Unfortunately, none of the studies compares the influence of price in relation to the country-specific macro-level variables in an international diffusion context. We address this gap and investigate the role of price, distribution and product quality on the local market potential over time.

Cross-Country Interactions. Cross-country interactions --- or spillovers of diffusion speed --- may occur across the dimensions of time and space (Peters and Kumar 2008). Accordingly, they potentially moderate local diffusion speed. If such spillovers exist, they may influence entry and marketing strategies: Marketing managers may either design their entry strategy to exploit these spillovers or may choose to leverage their marketing investments accordingly. We will consolidate the findings on the mostly time-based lead-lag or learning effect across studies first, before turning to review the modeling approaches incorporating more flexible country interactions. Table 1 exhibits the defined cross-country spillovers over time and across space in the studies reviewed here (cf. section "type of determinants").

Drivers of the Lead-lag and Learning Effect. In an early study, Poznanski (1983) investigate the correlation of the time passed since the introduction of the innovation in the first adopting country with the diffusion speed of lagging countries. Antonelli (1986) confirms his finding of a positive correlation later for modems in an econometric analysis, followed by various later studies (e.g., Takada and Jain 1991, Talukdar et al. 2002). Later, Ganesh et al. (1997) conduct a more comprehensive study on the drivers of what they coined learning effect. Their learning effect is based on the number of adopters in the lead country. They find the learning effect to be stronger with a higher degree of cultural and economic similarity --- measured as indices across Hofstede and several major economic variables respectively --- between the lead and lagging country. Antonelli (1986) adds that higher GNPs correlate with longer lags, while a higher GNP per capita ius associated with a shorter lag. He also finds that a higher activity of multinational companies (MNCs) in the country corresponds with a shorter lag. With respect to industry variables, Ganesh et al. (1997) show that single technical standards as well as continuous, rather than discontinuous, innovations are positively associated with the strength of the learning effect. Overall, the learning effect also increases with time passed, but distance to the lead country has no significant correlation (Ganesh et al. 1997). Their findings are later confirmed by Kumar and Krishnan (2002).

Summarizing, the results suggest that the learning effect seems to be a time and penetration based effect that may work to a large extent through global knowledge agglomeration and its (commercial) exchange. It seems intuitive that cultural and economic similarity between lead and lagging countries enhances this effect. Accordingly, we include this effect in our study and investigate its role in comparison to other drivers of diffusion speed.

Modeling Cross-Country Interactions. In addition to the lead-lag or learning effect as a one-to-many effect, in a globally networked world any country may actually interact across time and space with others. To this end, several models have been proposed to capture these interactions to a varying degree. To compare the different modeling approaches and highlight their differences, let us take the Bass Model as a point of departure (Bass 1969):

$$\frac{dF_i(t)}{dt} = \left[p_i + q_i F_i(t)\right]\left[1 - F_i(t)\right] \tag{1}$$

$F_i(t) = N_i(t)/m_i$ represents the cumulative penetration ratio till time t in country i, $N_i(t)$ and $n_i(t)$ represent the corresponding cumulative adopters till time t and the increase of adopters at time t respectively, and m_i is the market potential in country i. p_i and q_i represent the local coefficients of innovation and imitation. To compare the models we define $dF_i(t)/dt = n_i(t)/m_i = f_i(t)$ accordingly as the density function. For the Bass Model, the hazard rate of a country i is given as $f_i(t)/\left[1 - F_i(t)\right] = \left[p_i + q_i F_i(t)\right]$. For the lead-lag effect, early studies either relate q_i to the time passed since introduction (e.g., Poznanski 1983, Takada and Jain 1991) or specify q_i with an additional time-based term (e.g., Mansfield 1993, Lücke 1993). In contrast, Ganesh and Kumar (1996) expand the Bass Model to accommodate their specification of the learning effect, where the penetration in the lead country (i=1) enhances the local diffusion in lagging countries (with i=2,…, I; *Learning Model*):

$$\frac{f_i(t)}{1 - F_i(t)} = \left[p_i + q_i * F_i(t) + c * F_1(t)\right] \quad \forall \ i \neq 1 \tag{2}$$

The learning effect parameter c is constant over time and across countries. Setting p_i=0 they derive the *Pure Learning Model*, which outperforms the Bass Model and the Learning Model in their forecasting performance comparison. Ganesh et al. (1997) modify this Learning Model into a pooled cross-sectional time series model which accounts for a heterogeneous impact across countries:

$$\frac{f_i(t)}{1-F_i(t)} = \left[p_i + q_i * F_i(t) + c_i * \left(\frac{m_i}{m_1} \right) * F_1(t) \right] \ \forall \ i \neq 1 \qquad (3)$$

Additionally, c_i is a function of geographical, cultural and economic similarity indices as well as of the lead-lag effect. Yet both of these approaches resemble a one-to-many relationship.

Mahajan and Muller (1994) extend the Bass Model to accommodate bivariate cross-country influences:

$$\frac{f_i(t)}{1-F_i(t)} = \left[p_i + q_i * \frac{N_i(t)}{m_i + m_j} + q_j * \frac{N_j(t)}{m_i + m_j} \right] \qquad (4)$$

Their model only allows bivariate cross-country influences, but serves their purpose of identifying converging diffusion rates across the European Union well.

Putsis et al. (1997) propose the *Mixing Model*, where all countries influence each other's diffusion process contemporarily. They specify the hazard rate as:

$$\frac{f_i(t)}{1-F_i(t)} = \left[p_i(t) + q_i(t) * \left[\Phi_i * F_i(t) + \left(\frac{(1-\Phi_i) * \sum_{j=1}^{I} q_j(t) * N_j(t) * (1-\Phi_j)}{\sum_{k=1}^{I} q_k(t) * N_k(t) * (1-\Phi_k)} \right) \right] \right] \ \forall \ i \neq j \qquad (5)$$

where Φ_i is called the mixing parameter, with the extreme values of Φ_i=1 and Φ_i=0 representing complete segregation and random mixing respectively. This model extends the imitative force of the Bass Model with a weighted impact of contemporary external influence from all other countries. The authors find Φ_i to vary only by product category and not country, with values between .54 and .72. Additionally, both parameters $p_i(t)$ and $q_i(t)$ are a function of time-variant country-specific covariates. Van Everdingen et al. (2005) extend this model in several ways. First, all parameters are time varying. Second, they replace the number of adopters of other countries with their local penetration rate, where both the number of adopters and the market potential are time-varying. The market potential is a function of time-varying social systems size $m_i(t)$ multiplied by a time-varying ceiling parameter $d_i(t)$. Third, an influence can only occur once the diffusion in the respective country i has begun (i.e., $t \geq t_{0i}$). Summarizing, their *Extended Mixing Model* results in:

$$\frac{f_i(t)}{1-F_i(t)} = \left[p_i(t) + \sum_{j=1}^{k} q_i(t) * \varphi_{ij}(t) * \frac{N_j(t)}{d_j(t) * m_j(t)} \right] \tag{6}$$

The mixing probabilities $\varphi_{ij}(t)$ are specified as

$$\varphi_{ij}(t) = \Phi_i(t) + \left[1-\Phi_i(t)\right] * \left[\frac{q_j(t) * \left[d_j(t) * m_j(t)\right] * \left[1-\Phi_j(t)\right]}{\sum_{k=1}^{I} q_k(t) * \left[d_k(t) * m_k(t)\right] * \left[1-\Phi_k(t)\right]} \right], \text{ if } i=j \text{ and}$$

$$\varphi_{ij}(t) = 0 + \left[1-\Phi_i(t)\right] * \left[\frac{q_j(t) * \left[d_j(t) * m_j(t)\right] * \left[1-\Phi_j(t)\right]}{\sum_{k=1}^{I} q_k(t) * \left[d_k(t) * m_k(t)\right] * \left[1-\Phi_k(t)\right]} \right], \text{ if } i \neq j \tag{7}$$

But again, although being more flexible with time-varying parameters, it accommodates just contemporary cross-country influence between countries, in particular no lag-lead effect. To overcome this limitation, Kumar and Krishnan (2002) propose a unifying framework that allows various lead-lag, contemporary and lag-lead effects. Based on the Generalized Bass Model (GBM, Bass et al. 1994), their *Flexible Interaction Model* is specified as:

$$\frac{f_i(t)}{1-F_i(t)} = \left[p_i + q_i \cdot F_i(t)\right] * \left[1 + \sum_{j=1, j\neq i}^{k} b_{ij} * f_j(t)\right], \text{ with } k \in I \quad (8)$$

Here, the diffusion of country i may be influenced by the impulse of the contemporary penetration increase in any leading, simultaneously adopting or lagging country j (Kumar and Krishnan 2002). They demonstrate the potential of their approach with four case studies of various effect combinations, and also investigate the drivers of the cross-country influences. Finally, Albuquerque et al. (2007) propose a model that accounts for multiple country interactions across different dimensions and neighborhood sets:

$$\frac{f_i(t)}{1-F_i(t)} = \left[p_i + q_i * F_i(t) + \sum_{i,j=1}^{J\in I} q_{ij} * F_j(t)\right] \quad (9)$$

where J represents a set of countries based on neighborhood effects, which they define in terms of geographical and cultural distance as well as bilateral trade relations. Given their short time series and limited set of countries, they restrict the number of neighbors in each dimension to five. Additionally, all parameters are made a function of country-specific covariates. For any surplus information provided that is rendered uninformative within the Bayesian framework, the coefficient will shrink to the mean based on the pooled cross-country data.

Across these various modeling approaches and their empirical applications, all report significant statistical cross-country spillovers. Although Majahan and Muller (1994) report a first indication on converging diffusion patterns within the EU, asymmetric cross-country differences remain. The significant findings on the learning effect (e.g., Ganesh et al. 1997), are extended by Kumar and Krishnan (2002) to more flexible country-interactions for consumer innovations and by Albuquerque et al. (2007) to business innovations. Albuquerque et al. (2007) show that these asymmetric neighborhood relations may have product-specific weights: not accounting for cross-country interactions may thus lead to a substantial overestimation of within-country imitation speeds. To avoid biased parameter estimates that may induce misleading conclusions on entry and marketing-mix decisions, models of international diffusion need to account for (asymmetric) cross-country interactions. But except for the one-to-many lead-lag or learning effect, all proposed models may face difficulties in implementation for large country data sets. For the approach by Putsis et al. (1997), Kumar and Krishnan (2002) assume considerable challenges with the estimation process if other than contemporary effects are considered, especially in an unbalanced sample (this may hold to some extent for van Everdingen et al. (2005) correspondingly). But Kumar and Krishnan (2002) themselves implement their flexible approach just for up to four countries, while Albuquerque et al. (2007) restrict neighborhood sets to five countries. And again, none of the cross-country effects has been investigated in concurrence with marketing-mix or market structure variables, which are of elevated interest to managers. If these cross-country-spillovers should result from unobserved regional similarities of marketing-mix strategies, they may reflect a statistical artifact. Accordingly, there is still a need for a parsimonious diffusion model of cross-country interactions in combination with an investigation of the relative importance of marketing variables. To address this gap, we continue to define a parsimonious flexible interaction model in the next section.

3. A Parsimonious Model of Cross-Country Interaction

The insightful country-interaction models compared above are all limited to some extent in their implementation for larger data sets and variable country interactions. Additionally, we are rather interested in the relative importance of the lead-lag or learning effect, general spatial neighborhood effects and other macro-economic as well as industry and marketing variables. Hence, we need to develop a parsimonious model that covers the major cross-country interactions and accommodates other drivers in a parsimonious way. To this end, we build upon the approach by Kumar and Krishnan (2002, see eq. (8)). But instead of treating each country in the data set individually, we combine their influence across predefined (spatial) neighborhoods. In some way, we simplify the expression used by Albuquerque et al. (2007) and --- following the arguments in favor of simultaneous influence on innovative and imitative diffusion speed components in Kumar and Krishnan (2002) --- move it to the mapping function of the GBM:

$$\frac{f_i(t)}{1-F_i(t)} = \left[p + q \cdot F_i(t)\right] * \left[1 + \alpha * \left(t_{0i} - t_{0lead}\right) + \sum_{u=1}^{U} \beta_u * \frac{\sum_{j=1, j\neq i}^{k\in I} N_j(t-r)}{\sum_{j=1, j\neq i}^{k\in I} m_j(t-r)} + \sum_{v=1}^{V} \gamma_v * x_{iv}(t)\right] \qquad (10)$$

Note that the coefficients of innovation and imitation, p and q, are neither country-specific nor time-variant. Accounting for country heterogeneity only through country-specific variables is a strong restriction, but helps us here in investigating the comparative role of exogenous and industry as well as marketing-mix drivers of diffusion speed. This assumption may be relaxed. The first expression in the mapping function represents the time-based lead-lag effect. The learning effect as specified by Ganesh et al. (1997) can be generated within the flexible second term for cross-country interactions by restricting the first neighborhood effect (u=1) to the lead country, i.e., j=k=1, and setting the time lag of influence to zero, i.e., r=0 for including only contemporary lead-country penetration ($N_1(t)/m_1(t)$). Additionally, other (spatial) neighborhoods can be represented by additional (asymmetric) terms (e.g., here for p≥2 one only needs to specify other individual sets of k neighbors and their time lag of influence, i.e., r). The influence of collective (spatial) neighborhoods is calculated as their weighted mean, so higher penetrations in larger neighbors gain a higher relative weight (Ganesh et al. 1997). We think that this approach is appropriate if one analyzes the supposed influence, e.g., between a large France and Germany compared to their much smaller neighbor Luxembourg. Here, the mutual influence structure should reflect the size of France and Germany, and put Luxembourg's relative impact into perspective. Accordingly, the second term can accommodate various asymmetric cross-country influences without a restriction to five or ten countries. Finally, the last term of the mapping function allows for the inclusion of diffusion speed related covariates. Additionally, we make the local market potential $m_i(t)$ a function of a country-specific and time-varying $Base_i(t)$ as well as covariates, $z_i(t)$:

$$m_i(t) = Base_i(t) * \prod_{w=1}^{W} \left[z_{iw}(t)\right]^{\delta_w} \tag{11}$$

4. Data & Estimation

We continue with a description of the data and explain the estimation approach for our model variations.

4.1. Data Description

We investigate the international diffusion of cellulars. This innovation has been studied in earlier studies (e.g., by Dekimpe et al. 1998, Gruber and Verboven 2001a,b), although except for Islam et al. (2002) none investigates the role of marketing variables. Choosing this innovation allows us later to compare our results (e.g., Dekimpe et al. 1998, Ganesh et al. 1997, Kumar et al. 1998, Gruber and Verboven 2001a,b, Kumar and Krishnan 2002, Taludar et al. 2002, van Everdingen et al. 2005).

Countries. We include 183 countries with 1,995 observations in our study which makes it one of the most global studies in terms of countries covered (cf. table 1). For a list of all countries with their initial and final penetration rate, the individual time span covered and its lag to the lead country we refer to Appendix A. For all countries we verify adoptions, population and starting dates across several sources (e.g., Eurodata, ITU, WDI, ARC, OECD, and >1,400 international operator and regulator websites, Dekimpe et al. 1998). Finland is the lead country where diffusion is starting in 1980. All countries are covered through 2001, so country-specific periods covered a range from 2 to 22 (average value 10.93 periods, Std. Dev. 4.47). Initial penetration rates are .13% on average with a standard deviation of .30%. For thirteen countries initial penetration rates are above .5%, the level above which Dekimpe et al. (1998) and Tellis et al. (2003) recommend a special investigation.[2] In our case, these countries are small (e.g., Aruba, French Polynesia, Brunei, Dominica, Faroer Islands, Quatar, Reunion, French Guyana, Bermuda, Iceland, Botswana, Channel Islands, Gibraltar). According to industry sources and regulating

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[2] Chandrasekaran and Tellis (2008) propose a stricter rule of .25% which in our case does not seem appropriate given the thorough check of secondary sources.

agencies, governments and relatively big local companies adopted immediately after a late introduction (in 1991 on avg.). As the year of introduction is not disputed and any potential bias induced being most likely neglible in a large pooled data sample, we chose to include them in our analysis. Final penetration rates range from .02% to 96.90%, with an average value of 25.00% (Std. Dev. 27.50%). The corresponding descriptives for all 1,995 observations across all periods and countries are given in table 3.

Lead-lag Effect. We chose to include the time-based lead-lag effect instead of a learning effect definition. In combination with the neighborhood effect this allows for better separation of time-based and penetration-based spatial effects. On average, the lag to the lead country is 11.07 periods (Std. Dev. 4.47), ranging from 0 to 20 periods. The corresponding statistics for all 1,995 observations are given in table 3. According to the literature, we expect a positive effect on local diffusion speed.

Neighborhood Penetration. The 183 countries have 708 combined neighborhoods of first degree, i.e., adjacent countries relationships. The neighborhood effect is calculated as given in the mapping function in equation (10). We calculate lagged weighted neighborhood penetrations, i.e. we set r=1. Across all individual neighbors, we first sum up the lagged cumulative adopters and the lagged market potentials based on time-variant populations. From these variables we calculate the weighted neighborhood penetration for each country and period, resulting in values given in table 3. In line with the literature, we expect a positive effect on local diffusion speed.

Population and Economy. For all countries, we take the population figures from the World Bank database "World Indicators". For some countries, we complement missing numbers from national sources and validate them with other secondary sources, e.g. United Nations data. The population data is used in the calculation of (neighborhood) penetration rates. GDP per capita (pc) data is also taken from the World Indicator database and - where necessary - complemented from other secondary sources. We adjust the GDP pc data for Purchasing Power Parities (PPP) and calculate them in constant 1995 international dollars over time. This adjusted GDP pc data is needed for the income weighted price index calculation below. The data on the Gini-Coefficient of income is compiled from the Texas and Penn State University sources following the guidelines of Van den Bulte and Stremersch (2004) and complemented from secondary sources (see table 3 for descriptives).

Table 3. Descriptive Statistics

Descriptive Statistics (1,995 observations)	*Mean*	*Std. Dev.*	*Min.*	*Max.*
Penetration Rates	7.1736	15.0189	0.0001	96.904
Lead-Lag Effect	9.2607	4.4074	0.0000	20.000
Neighborhood Penetration	4.2318	9.3860	0.0000	72.737
Factors on Culture, Language, Religion and Ethnic Groups				
CLRE 1	0.0246	0.1548	0.0000	1.0000
CLRE 2	0.4266	0.4805	0.0000	1.0000
CLRE 3	0.2738	0.4270	0.0000	1.0000
Factors on Climate, Geography and Hazards				
CGH 1	0.0236	0.1517	0.0000	1.0000
CGH 2	0.0411	0.1986	0.0000	1.0000
CGH 3	0.1461	0.3491	0.0000	1.0000
CGH 4	0.3182	0.4505	0.0000	1.0000
Factors on Political Situation				
POL 1	0.0145	0.1197	0.0000	1.0000
POL 2	0.0261	0.1594	0.0000	1.0000
POL 3	0.1347	0.3397	0.0000	1.0000
POL 4	0.2653	0.4353	0.0000	1.0000
Competition, CO(t)	1.7063	1.0780	1	7
Prepaid Introduction, PI(t) (Dummy)	-0.4697	0.8831	-1	1
Incoming Call Charges, ICC(t) (Dummy)	-0.4323	0.9030	-1	1
Cellular Waiting List, CLW(t) (Dummy)	-0.9639	0.2663	-1	1
Digital Standard, DS(t) (Dummy)	0.0586	0.9985	-1	1
Product Quality Index, PQI(t)	0.6289	0.4557	0.0000	0.9910
Population Coverage, COV(t)	0.6631	0.3369	0.0100	1.000
Gini-Coefficient on Income, GI(t)	0.4015	0.0944	0.1800	0.7040
Composite Price Index, CPI(t)	10.7265	310.8119	0.0061	13,546.328
Composite Price Index, CPI(t) - excl. extreme values (1,955 obs.)	0.8808	1.4197	0.0061	9.954

Factors on Culture, Language, Religion, and Ethnic Groups. Dekimpe et al. (2000c) suggest subsuming variables from these areas into a broader group of culture-related variables. We follow their approach and identify 25 different variables across our sample of 183 countries describing these aspects of culture (cf. Appendix B1 for a listing and detailed description of items). To include these variables in a parsimonious manner, Dekimpe et al. (2000c) propose to extract a reduced number of factors resulting in multi-item measures of culture. As these items have different scales we apply Latent Factor Analysis with two segments. Based on BIC and bootstrapping the significance of the -2LL-difference, we extract three factors explaining most of the variance across these measures (see Appendix B1 for details on the LC-EFA) and label them as factors CLRE_1-3. Table 3 contains descriptives on these factors. We expect varying positive and negative influences on diffusion speed as these factors have not been investigated before.

Factors on Climate, Geography, and Hazards. Dekimpe et al. (2000c) suggest that climate, geography and its related variables may explain additional variance in international diffusion models. To the best of our knowledge, this proposition has not yet been comprehensively investigated. We follow their suggestions and collect 46 different items on climate regions, geographic descriptions and local hazards across 183 countries. As these items have different scales we follow the same approach as above and extract four factors, which we label CGH_1-4 (for details on the LC-EFA please refer to Appendic B2). Table 3 contains the descriptives on these four CGH-factors. We expect varying positive and negative influences on diffusion speed as these factors have not been investigated before.

Factors on the Political Situation. Dekimpe et al. (2000c) also propose to investigate the influence of local politics on the international diffusion of innovations. We collect 16 items on the local political situation across 183 countries and apply the same latent factor approach due to varying scales. We extract four factors describing the political situation in each country. Table 3 describes these four factors which we label POL_1-4 (see Appendix B3 for details on the LC-EFA). We expect varying positive and negative influences on diffusion speed as these factors have not been investigated before.

Industry Variables. Competition has been specified as the number of competitors in each period. As a competitor we count only mobile network owning companies as they determine the range in which tariffs can be set for service providers. The data has been collected through industry sources and regulating agencies. Most countries started the diffusion process with one national incumbent. In 2001, Taiwan has the most competitive environment with 7 competing networks. We expect a positive effect of competition on the local diffusion speed.

Capacity constraints for new technologies may result in waiting lists as current demand cannot be met. In the telecommunication sector such waiting lists are often monitored by a government agency. Accordingly, the information is publicly available. An existing waiting list may induce lower diffusion speed parameters when not accounted for. This effect has been investigated in several scientific studies (e.g., Ho et al. 2002, Jain et al. 1991, Kumar and Swaminathan 2003, Simon and Sebastian 1987), but only Islam and Fiebig (2001) as well as Talukdar et al (2002) analyze its impact in an international diffusion context. We account for the existence of a waiting list with an effect coded dummy variable as we do not have explicit numbers of the size of the waiting list for all countries and periods affected. In our sample, only 6 countries have been recorded with cellular waiting lists (Belgium, France, Germany, Italy, Sweden and Switzerland), all of them in the late 1980s to the early 1990s before the digital cellular technology standards have been introduced (duration between 3 and 6 years).

Accordingly, the average and standard deviation are both very low. We expect a negative impact on local diffusion speed.

Marketing Variables. We investigate six marketing related variables in our international diffusion context. Two of them represent product quality development, three reflect price-related issues and another one indicates the level of distribution within a country.

With respect to product quality, we account for the introduction of a second generation technological standard, i.e., the transition from analogue to digital technology. Digital technology standards did not only allow for greater capacity (e.g., Gruber and Verboven 2001a), but also for better product quality features like better noise reduction and greater privacy levels (e.g., Gruber and Verboven 2001b). The new standards also had a substantial long-term impact, allowing more and better services as well as better cost-benefit ratios that subsequently translate into lower call charges and equipment prices (e.g., Paetsch 1993, p. 286f., Garrard 1997, p. 145f.). We collect the data on (digital) standards from various secondary sources (e.g., ARC, ITU, regulatory agencies and mobile operators) and confirm them with other studies (e.g., Gruber and Verboven 2001b, Paetsch 1993, Garrard 1997). Again, Finland is the earliest adopting country in 1991. By 1996 and 2006, 69 and 160 countries introduced a digital standard. We expect a positive influence on local diffusion speed.

To capture the degree of quality development over time, we additionally construct a quality index. This index comprises standardized equipment weight, standardized talk and standby times from 1980 to 2001. We compile this data from several industry websites (s.a.) and validate it across other studies (e.g., Paetsch 1993, Garrard 1997). As these statistics are only available by technical standards across countries, for each country and period we refer to the best local alternative, i.e., the standard which provides the superior offer. This is in line with the global nature of the handset industry, as the producing companies like Nokia or Motorola have been providing mobile operators with comparable models across the world from the start. Accordingly, experience and cost effects of scale have been reaped globally, with lagging countries not only benefiting from early adopters driving down unit costs, but also from higher quality (compare, e.g., Bass 1980 for national discussion in the context of diffusion). In our sample, terminal weight comes down from 3kg in 1980 for analogue systems to 80 and 50 grams for the latest digital standards respectively. Battery-based talk time increases from zero minutes - early models needed external electricity supply - to 360 minutes in 2001 for the latest digital handset models, while stand-by time increased from zero minutes to 720 minutes accordingly. All three items have been standardized and equally weighted in our index on product handset quality. It ranges from 0 to .991 dependent on the technological standard in each country and period, with an average across countries and periods of .6289 (Std. Dev. .4557, cf. table 3). We expect a positive influence on the local market potential or diffusion speed with increasing quality.

With respect to price, we investigate the influence of three aspects. First, we evaluate the impact of prepaid price plans. In the beginning, only post-paid contracts were available which require adopters to have a bank account and a positive credit record. This not only excluded a substantial share of the population in industrialized countries, but especially limited adoptions in less developed countries. In contrast, prepaid price plans allow adopters to buy a service connection --- mostly bundled with a cheaper cellular version --- and pay for specified minute packages upfront. This pricing concept also reduces risk for both parties: the adopter has a built-in spending limit and the provider gets paid upfront, incurring no payment risk (e.g., Barrantes and Galperin 2008, Hodge 2005, Minges 1999). Usually, the prices per prepaid minute are higher than for post-paid contracts. Accordingly, specifying an effect coded dummy variable when prepaid plans are available in a given country and period does not necessarily correlate with a price index. It rather measures the impact of the marketing concept, which spreading across countries may be associated with a cross-country learning effect. In our sample, the United States and Hong Kong introduced the innovation in 1995. In 1998 and 2001, prepaid plans were available in 73 and 163 countries respectively. We expect a positive influence on local diffusion speed.

Second, charging for incoming calls is another important aspect of price plans. A recent study by Littlechild (2006) argues that charging for incoming calls (receiving-party-pays, RPP) does not lead to lower penetration rates compared to countries with calling-party-pays (CPP) regime. It is argued that average price per call is significantly lower while minutes per user are higher. On the other hand, charging for incoming calls creates uncertainty for adopters as they perceive not to be in control on this part of their budget. As we account explicitly for average prices across countries, we specify the presence of RPP-regimes as an effect coded dummy variable. Hence, this variable measures the influence of the price concept itself and not its budget implication. In our sample, 58 countries had a RPP-regime at a certain point of time. It has been introduced in 1984 in the United States, Singapore and Hong Kong with the AMPS-standard. By 1997, 49 countries had introduced a RPP-regime. This number dropped to 33 countries by 2001, mainly with the introduction of European digital standards. The effect on local diffusion speed may be positive or negative, depending on which aspect of RPP prevails.

Third, we construct a composite price index to account for the effect of price on the international diffusion of cellulars. As postpaid contracts are usually cheaper than prepaid tariffs, we chose the cheapest postpaid tariff in each country and period as our base. As some tariffs include free minutes, we compared specifications of approximately 120 minutes with the cheapest regular postpaid contracts. Our price index consists of five elements: the price of the equipment, the connection fee, the monthly subscription and peak- as well as off-peak minute prices. All prices have been compiled manually over 5 years from ARC, Eurodata, and ITU as well as more than 1,400 regulator and mobile operator websites across the world. All prices are originally given in local currency units. In a first step they have been converted by PPP weighted exchange rates into constant 1995 PPP international dollars. In a second step these values were then divided by GDP pc in constant 1995 PPP international dollars to derive the relative prices of each component with respect to local comparable income. These prices are combined to an annual income weighted budget in the following way: The equipment and connection price are depreciated over 24 months, so 50% of both price elements represent the basis for every yearly period. Monthly subscription is multiplied by 12 to derive the annual spending. With respect to usage, we assume 100 peak- and off-peak minutes per month, i.e., 1,200 minutes each per year. The minute consumption is based on international usage statistics across countries and periods. In our sample, we have extreme annual income weighted budget values of up to 13,546 years of income. These extreme values, here Brazil during its phase of hyperinflation from1990-1993, depressed cumulative penetration rates to virtually zero for those years, i.e., the maximum penetration rate was .12% in 1993. With the introduction of the new currency, prices dropped very fast to 30.5% of average income in 1995 and 8.7% in 2000. Over that time span, cumulative penetration rates rose from .9% to 13.6% respectively. Inclusion of the extreme values results in a high mean of 10.73 years of local weighted income across all periods. If we exclude those 40 extreme values of more than 10 years of income, the mean across the remaining 1,955 observations reduces to .88 years of income. In industrialized countries, the minimum is at .6% of annual income in the Netherlands in 2001.

Figure 1. Relationship between Cumulative Penetration,

Income Distribution and Price Index

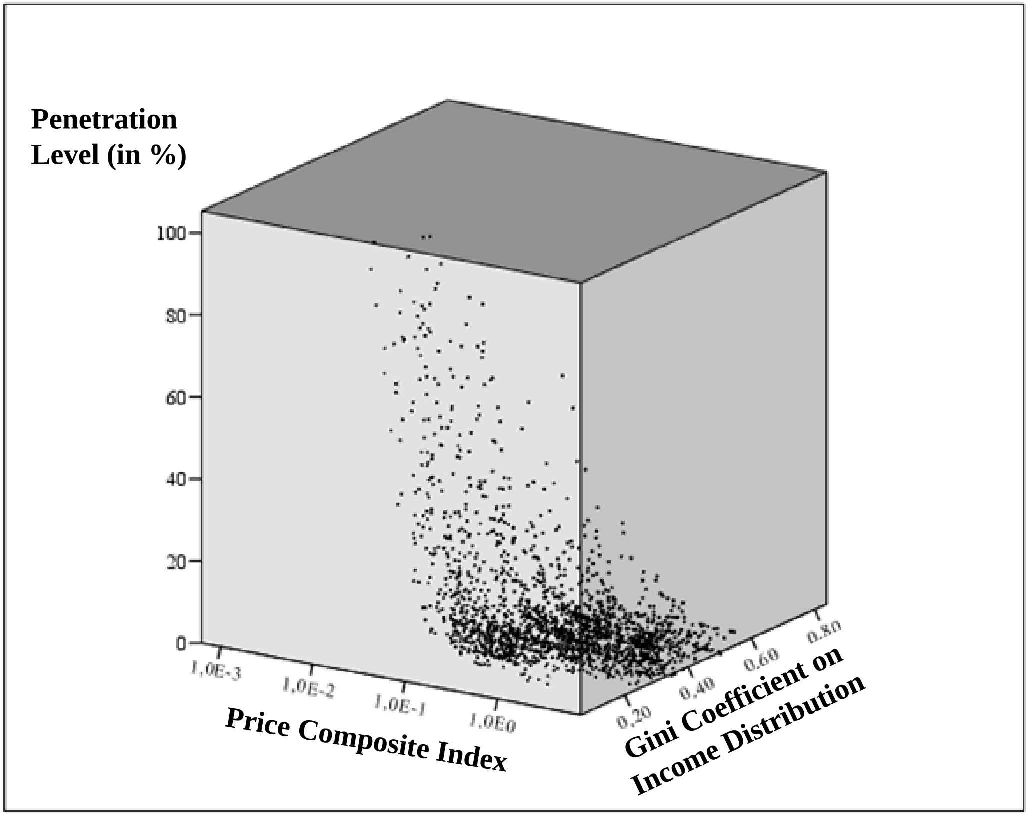

Figure 1 shows the nonlinear relation between the composite price index and the cumulative penetration rates. Penetration rates substantially increase only after the index drops below 10% of annual income. The relationship is moderated by the income distribution in each country, i.e., the Gini-index. In our data, higher inequality correlates with relatively higher penetration rates for very high prices (on a low cumulative penetration level), and for substantially lower ultimate penetration values for lower prices. This seems to support the notion that reference prices for adoptions are related to income levels across adopter populations, i.e., that income heterogeneity plays in role in shaping diffusion curves (see Van den Bulte and

Stremersch 2004 for a detailed discussion). We expect both variables to jointly influence the local market potential, resulting in negative elasticities.

The variable of population coverage is an indicator on the distribution of cellular services. As mobile networks require a substantial infrastructure investment, their build-up naturally takes up more than a year for larger countries. Mobile operators started with their network build-up in the major population centers covering major routes within countries first, before gradually extending their coverage. In some countries regulators obliged mobile operators to cover certain shares of the population by fixed dates, eventually representing universal coverage. As cellulars do not work in areas not covered by the networks, this limits their potential adopter population accordingly. Not accounting for the degree of coverage at a given period would result in artificially lower diffusion speed parameters. In diffusion research, Jones and Ritz (1991) represent an early study on the effect of distribution on a national diffusion process. They expect people not having access to the innovation to lower the market potential. We follow their suggestions and let population coverage moderate the market potential for a given period. In our sample, initial population coverage varies between 1% and 100%, e.g., for Mexico and Andorra respectively. On average, initial coverage is 30% with a standard deviation of 26%. Most countries reach a coverage of 70% after 7 years (Std. Dev. 32%) and 90% after 13 years (Std. Dev. 19%). Not accounting for this distribution effect thus may induce a substantial underestimation bias of diffusion speed, resulting in misleading strategy recommendations for companies. We expect that including this variable as a moderator of the local time-variant market potential improves the explanatory power of the model.

Summarizing, we explicitly investigate various marketing-related variables that reflect company decisions and shape local within-country diffusion processes. These variables allow us to compare their influence with the proposed macro- and socioeconomic variables from earlier studies. Next, we briefly describe our estimation approach.

4.2. Estimation Procedure

Since Bass (1969), various estimation approaches have been proposed for models of (international) diffusion. Besides the estimation method, some important issues have to be taken care of to avoid a bias in parameter estimates. Referring to Peters and Kumar (2008) for further details, we give a brief overview on these issues and describe our approach in addressing them. Second, we discuss the spatial AC and approaches to deal with it in international diffusion modeling. We introduce the concept of Moran's I to international diffusion modeling and conclude with a brief section on our estimation approach.

Building on Dekimpe et al (2000c), Peters and Kumar (2008) recommend to address six major estimation issues apart from the method chosen. First, data pooling across countries and time should be implemented. Since Lindberg (1982), many studies have found parameter estimates to be more robust and forecasts to be more accurate with pooling data across countries and periods (e.g., Gatignon et al. 1989, Helsen et al. 1993, Dekimpe et al. 1998). We pool the data across countries and over time, then we move all local starting points to the common origin. In doing this, we treat all diffusion processes as they started at the same time, with the lead-lag effect capturing differences owned to the various local starting points in real time. Second, sample matching should be conducted. With sample matching, Dekimpe et al. (2000c) refer to the matching of the market potential with the unit of adoption. In our case, the appropriate basis of the market potential or unit of adoption is the time-varying population of each country (e.g., Dekimpe et al. 1998, Gruber and Verboven 2001a,b). We later specify the market potential as a function of time-varying covariates. Third, one should avoid a left-hand truncation bias. Such a bias occurs, when the first observation available for a country does not reflect the true commercial introduction time. Accordingly, one would measure a deviating higher initial penetration, which in turn leads to upward biased innovative speed components and lower estimates of the other parameters, i.e., imitation speed and market potential. As a guideline, no first-year penetration should be greater than .5% (e.g., Dekimpe et al. 1998, 2000c, Tellis et al. 2003). As described already above, all countries have been checked according to this guideline and 13 identified cases verified through industry sources. Through the pooling of the data any remaining bias induced should be negligible. Fourth, the adoption across countries (breadth) and within-country diffusion processes (depth) are interlinked (e.g., Dekimpe et al. 2000b). Not accounting for both processes simultaneously may result in a loss of information. As our investigation focuses on the relative importance of drivers that shape differences of within-country diffusion patterns, we leave a coupled investigation of both processes for future research. Fifth, Dekimpe et al. (1998, 2000c) suggest a two-stage estimation procedure for the Nonlinear Least Squares (NLS) approach (e.g., Srinivasan and Mason 1986) to avoid the parameter bias induced by jointly estimating the diffusion speed components and the market potential (cf. Van den Bulte and Lilien 1997, Bemmaor and Lee 2002). We use NLS for all models with given market potential and confirm our results for the model with an estimated market potential by another estimation method that does not induce this bias. Sixth, we need to take care of error term structures. For international diffusion models, Dekimpe et al. (2000c) suggest to test for spatial autocorrelation. We will elaborate this issue briefly, before describing our estimation approach.

In the literature, three different types of spatial patterns are distinguished: spatial lags (e.g., like the neighborhood effect), spatial drift (e.g., model parameters are a function of location) and spatially correlated errors (e.g., Anselin 1988, Bradlow et al. 2005). Not specifying a correct model, e.g., omitting important or not available latent variables, may leave it to the error term to capture these unobserved processes or underlying heterogeneity. Spatial AC is normally dealt with by specifying an AC-error term. Recently, Albuquerque et al. (2007) applied this approach to international diffusion modeling. Here, a matrix of spatial neighborhoods is inserted into the estimator to account for spatial dependence. Accordingly, this matrix has the same structure as the error term, i.e., for 183 countries, this results in a 183x183 neighborhood matrix with 33,489 cells. But especially for large data sets, this matrix is often too sparsely populated to be invertable without problems. In our case the 183 countries have only 708 neighborhoods which fills just over 2.1% of all cells. One could now reduce this matrix through factorization (e.g., Lee and Seung 1999), but that would result in a reduced matrix that cannot be multiplied due to its diverging rank. Therefore, we estimate our models without a spatial AC error component, but rather introduce the test statistic Moran's I (Moran 1950, Anselin 1988) to international diffusion modeling. This statistic is generally defined as $I = \frac{O}{S_0} * \frac{x'Wx}{x'x}$ with O as the number of observations, S_0 as the sum of contemporary spatial weights, x and W as the matrices of observations and spatial weights respectively. It has been applied in marketing earlier, but rarely (e.g., Albers 1989, p. 543, Bronnenberg and Mahajan 2001). Its test statistic follows -1/(O-1), i.e., with increasing observations O its expected mean approaches zero. For values around zero, no spatial AC is present. Other values indicate positive or negative spatial AC, i.e., here positive or negative spatial dependence with neighboring countries. In our case, before calculating Moran's I, we have to move all errors back from diffusion period time to real time, i.e., to reverse the left-hand alignment of all time series to a common origin. Accordingly, as countries adopt subsequently in real time, over time the number of cross-sectional observations and spatial neighborhoods may change in each period. Accordingly, we adapt Moran's I to reflect a temporally weighted mean across time periods:

$$I=\sum_{t=1}^{T}\left[\frac{1}{T}*\frac{O(t)}{S_0(t)}*\frac{\sum_{i=1}^{I}\sum_{j=1}^{I}w_{ij}*\left(\varepsilon_i(t)-\overline{\varepsilon}\right)*\left(\varepsilon_j(t)-\overline{\varepsilon}\right)}{\sum_{i=1}^{I}\left(\varepsilon_i(t)-\overline{\varepsilon}\right)^2}\right]\ [-1,1] \tag{12}$$

We will test all of our models for the presence of spatial AC.

Finally, we address our choice of estimation method. We use NLS as a primary method and estimate our model (10) for cumulative penetration rates in the time-domain (e.g., Srinivasan and Mason 1986, Hardie et al. 1998):

$$F_i(t)=\overline{m}_i(t)*\left[\frac{1-e^{-(p+q)*t*MF_i(t)}}{1+\left(\frac{q}{p}\right)*e^{-(p+q)*t*MF_i(t)}}\right]+\varepsilon_i(t)\ \text{ with }\ \varepsilon_i(t)\sim N(0,\sigma_\varepsilon) \tag{13}$$

with $F_i(t)$ as the cumulative penetration rate of country i at time t, i.e., $N_i(t)$ divided by the population at t, $\overline{m}_i(t)$ representing the market potential with an adjusted base for the extraction of the dynamic population figure. We extract the absolute dynamic population to ensure that bigger countries do not get a larger weight in our pooled regression. The mapping function $MF_i(t)$ as in equation (10) is being integrated (cf. Bass et al. 1994) and inserted into equation (13). For the last economic model, the market potential is specified as in equation (11).

When using NLS, a bias is introduced by estimating m in conjunction with p and q (Van den Bulte and Lilien 1997, Bemmaor and Lee 2002). In our case, m is given for six out of seven models estimated. Additionally, all our data is pooled and therefore contains many countries at various points in the diffusion process, which should dampen any effect considerably. For the seventh model, where we estimate all parameters jointly, we confirm our results by using genetic algorithms (GA), which avoids this bias (Venkatesan et al. 2004, cf. also Venkatesan and Kumar 2002). In their review, however, Meade and Islam (2006) show that both approaches should result in similar estimates when the objective function, i.e., the related surface, is smooth. In this case NLS should be even more efficient than GA. They also report that for shorter time series NLS should produce equivalent results to Maximum Likelihood estimation for cumulative adoptions (MLE, e.g., Hardie et al. 1998, Schmittlein and Mahajan 1982). Accordingly, we estimate cumulative penetration rates[3] with NLS as described above and confirm the results for the economic model with GA.

5. Empirical Results

Estimating the models with the developed estimation procedure for 183 countries and 1,995 observations yields the results shown in Table 4. Before discussing the empirical results we comment on the diagnostics briefly.

5.1. Fit and Diagnostics

The model comparison shows the Bass Model with a dynamic market potential having the lowest adj. R^2=.50. Spatial AC is substantial (.49), although the estimates of p and q are within plausible ranges (Sultan et al. 1990). Adding the lead-lag effect increases the adj. R^2 to .57 and reduces the spatial AC to .37, as the parameter values of p and q change significantly. Introducing the neighborhood effect of first degree raises adj. R^2 further to .62, lowers the lead-lag effect to some

[3] The results for $f_i(t)$ correspond with those for the cumulative penetration rates in terms of variance explained (albeit on a lower level), variables kept, parameter directions and strength as well as for Moran's I. Results are available from the authors upon request.

extent and restores the previous value of q, while leaving p still low. Spatial AC is reduced substantially to .15, although still present to some extent.

Extending the mapping function with the factors on culture, language, religion and ethnic groups raises adj. R^2 further to .68, but has no impact on spatial AC (.16). Only the neighborhood effect is halved by their introduction. The value of q goes up to .32. In the next model, factors of climate, geography and hazards are incorporated. The adj. R^2 increases marginally to .71, but spatial AC remains stable like the values for p and q. It is interesting that the barely significant cultural factor CLRE_1 is dropped and only three factors on climate enter the equation. The neighborhood effect remains unchanged compared to the previous model, while the lead-lag effect increases somewhat. Only two of the factors on the political situation enter the model in the next step, increasing adj. R^2 only marginally to .714. All other diagnostics and parameters are left unchanged.

As this model resembles most of the influences usually investigated in the context of international diffusion modeling, we now compare it with an economic model of industry and marketing variables. This model has the highest adj. R^2 with .85 and the same level of low spatial AC as the previous models (.17). The value of q is much lower (.14), but still reasonable (Sultan et al. 1990). The lead-lag effect is strongest as the neighborhood effect is not significant anymore. The five industry and marketing variables eliminate all factors relating to culture, climate or the political situation. Using GA to estimate the model confirms the results on diagnostics (adj. R^2 .88), the variables retained and the parameters in direction and level, albeit with some variation.

5.2. Discussion

Comparing the models in detail, various insights can be drawn. First, the Bass Model with dynamic market potential fits the data reasonably, given that p and q are not country-specific. Accordingly, the model does not account for any major heterogeneity across countries and thus the high spatial AC indicated is not surprising.

The lead-lag effect seems to have a spatial component, too, as its introduction reduces spatial AC by 25%. It is also interesting to note that the lead-lag effect reduces the innovative speed component p and raises the imitative component q. So we may conclude that not specifying the international lead-lag effect induces a bias to overestimate the local innovative element, which confirms the findings of Ganesh et al (1997). This alone would have implications for a decision on the entry decision. It would also have major implications for resulting marketing plans.

The introduction of the neighborhood effect brings spatial AC to its lowest and thereafter maintained level, while explaining additional variance. We conclude that the additional specification of this neighborhood effect is a valid measure to reduce spatial AC in models of international diffusion when no other drivers are incorporated.

Table 4. Results

Parameters	*Model Specification* Bass Model (TD)	GBM 1 (TD)	GBM 2 (TD)	GBM 3 (TD)	GBM 4 (TD)	GBM 5 (TD)	GBM 6 (TD)
Coeffcient of Innovation, p	.0020 *(.0002)*	.0003 *(.00005)*	.0009 *(.0001)*	.0006 *(.0001)*	.0005 *(.0001)*	.0005 *(.0001)*	.000014 *(.000001)*
Coefficient of Imitation, q	.2621 *(.0094)*	.3399 *(.0107)*	.2567 *(.0100)*	.3233 *(.0103)*	.3194 *(.0100)*	.3162 *(.0099)*	.1435 *(.0050)*
Mapping Function							
Lead-lag effect, α		.0477 *(.0024)*	.0313 *(.0033)*	.0357 *(.0024)*	.0409 *(.0025)*	.0414 *(.0025)*	.0673 *(.0029)*
Neighborhood Effect, β_1			.0378 *(.0028)*	.0188 *(.0021)*	.0189 *(.0021)*	.0186 *(.0021)*	
Factors on Culture, Language, Religion and Ethnic Groups							
CLRE_1, γ_1				-.3650 *(.1893)*			
CLRE_2, γ_2				-.0665 *(.0122)*	-.0922 *(.0124)*	-.0467 *(.0144)*	
CLRE_3, γ_3				-.1790 *(.0148)*	-.1822 *(.0152)*	-.1262 *(.0175)*	
Factors on Climate, Geography and Hazards							
CGH_1, γ_4					.1834 *(.0303)*	.1735 *(.0311)*	
CGH_2, γ_5							
CGH_3, γ_6					-.1970 *(.0219)*	-.1984 *(.0219)*	
CGH_4, γ_7					.0593 *(.0111)*	.0590 *(.0114)*	
Factors on Political Situation							
POL_1, γ_8							
POL_2, γ_9						-.1310 *(.0570)*	
POL_3, γ_{10}							
POL_4, γ_{11}						-.1332 *(.0220)*	
Competition, γ_{12}							.0369 *(.0070)*
Prepaid Introduction, γ_{13}							.2926 *(.0230)*
Incoming Call Charge, γ_{14}							-.0750 *(.0070)*
Cellular Waiting List, γ_{15}							-.2188 *(.0240)*
Digital Standard Present, γ_{16}							.2628 *(.0230)*
Drivers of Market Potential							
Population, POP(t)	√	√	√	√	√	√	√
Given Population Coverage, COV(t)							√
Gini-Coefficient on Income Distribution, δ_1							-.8590 *(.0430)*
Composite Price Index, δ_2							-.3460 *(.0120)*
Model Fit and Test Statistics							
Adj. R^2	.4956	.5650	.6180	.6830	.7080	.7140	.8465
Moran's I	.4946	.3672	.1524	.1599	.1563	.1559	.1716
# of Observations	1,995	1,995	1,995	1,995	1,995	1,995	1,995

() asymptotic standard errors

The factors on culture explain additional variance while simultaneously drawing on overlap with both previously specified effects. As culture, language and religion have a strong regional component also neighborhood effects are related to some extent with these variables. Dekimpe et al. (2000c) suggest that factors on climate and geography may help in explaining differences in diffusion processes across countries. Our results confirm their hypothesis to some extent as these factors have a low correlation with speed here and explain only marginal additional variance. That a factor on culture is dropped in the process indicates that regional climate overlaps to some extent with regional culture, but culture still seems to reflect most of the regional contagion. Factors on the local political situation have only limited explanatory power.

Finally, we compare the full factor model with our economic model of industry and marketing variables. First, both intrinsic speed components p and q are at their lowest level across all models. This indicates that in our case cross-country effects, industry and marketing variables influence a substantial share of local diffusion speed. Second, the lead-lag effect is at its highest level, indicating that innovative impulses may indeed be transported to lagging countries internationally. Also, imitation may be only to some extent intrinsic, although our model does not explain how this learning across country works. Third, the neighborhood or regional cross-country interaction effect is not significant anymore. This result may indicate that the measurement of regional spillovers in previous findings may need further investigation. In our application, its significance in the first model specifications may be owned to similar --- but unobserved --- regional industry and marketing policies.

Fourth, all 11 investigated exogenous factors are not significant anymore, confirming the higher correlation of industry and marketing variables in international diffusion, at least for cellulars. This is very good news for international marketing managers, as they indeed may shape local diffusion patterns with their toolkit to a large extent.

Fith, all variables have the expected signs and plausible values, also allowing a comparison of their relative weight. For the mapping function, all variables are effect-coded dummy variables. Competition has the lowest, but still positive effect, confirming expected results by, e.g., Gruber and Verboven (2001a,b). For product related variables, not providing sufficient capacity resulting in a waiting list correlates with lower growth rates, as expected confirming results from, e.g., Islam and Fiebig (2001). Introducing a digital standard --- which comes with many more features for users, more efficient capacity use etc. --- is as expected associated with substantially higher growth rates. Accordingly, governments and companies as decision making units should act early and decisively in favor of innovative standards, increasing consumer welfare. With respect to pricing, charging for incoming calls reflects in lower diffusion speed. This finding is in contrast to the effect postulated by Littlechild (2006), so the risk aversion seems to be the stronger effect. The introduction of prepaid calling plans is a major marketing innovation that addresses the risk perception and consumers with limited budgets. Its success is associated with the high additional speed that is measured here, confirming earlier propositions, e.g., by Minges (1999), in a global context.

Sixth, from the drivers of market potential, two are related to price and budgets. The quality index does not enter the model, neither in the market potential nor the mapping function. Analyzing the correlation between price and quality indices, we find that they are negatively correlated. This finding supports the argument of Bass et al. (1994) that only deviations from natural price or quality paths should influence the diffusion pattern. Here, only the PPP and income weighted composite price index has a strong negative association with the market potential. Higher prices are related with lower market potential, which confirms findings on the national level (cf. table 2). Taken together, in our model the price related variables split between diffusion speed in the mapping function (incoming calls, prepaid plans) and market potential (composite price index) which may explain the inconclusive earlier findings on the influence of price on speed and potential (cf. table 2). The Gini-Coefficient has the expected sign, i.e., higher inequality is associated with lower market potential. This finding is in line with expectations. Most insignificant findings on the income distribution have either been related to the time-to-takeoff (Tellis et al. 2003, Chandrasekaran and Tellis 2008) or growth duration (Stremersch and Tellis 2004), both of which would suggest an influence on diffusion speed that we do not find either. Another finding is that both, the price index and the Gini-Index, may interact in moderating the market potential, i.e., in countries with higher inequality lower price levels are needed to result in the same size of the market potential. As we do not allow for country-specific p and q, we cannot confirm the insights on the findings of Van den Bulte and Stremersch (2004) with respect to the q/p-ratio. Nevertheless, our findings support their major conclusion that apart from social contagion (income) heterogeneity seems to play an important role in the diffusion process. In our model, the effect of intrinsic local social contagion is substantially lower than in all other investigated models of exogenous drivers, even though it is significant and substantial. Our results may thus add to the discussion by providing another balanced finding on both drivers, social contagion and income related adopter population heterogeneity.

Finally, distribution also plays an important role in international diffusion. Accounting for the population coverage of mobile networks improves the model, as it limits the market potential in terms of the potential adopter population. This finding constitutes another contribution and is in line with expectation (e.g., Jones and Ritz 1991).

6. Conclusions

Our study contributes to the existing literature in several ways. First, we find that using industry and marketing variables explains most of the variance and results in the superior model for cellulars. None of the previously investigated macro- and socioeconomic variables enters the final economic model, indicating that many of them may serve as proxies for economic and marketing similarities among countries. After all, people and countries may not be that different when it comes to marketing. This not only supports the notion of Farley and Lehmann (1994), but is indeed very good news for marketing managers: They seem to shape diffusion processes across countries employing their natural toolkit, the marketing-mix. Another insight is related to cross-country effects. Whereas the lead-lag effect correlates significantly with local diffusion speed in lagging countries, the neighborhood effect disappears once industry and marketing-mix variables are included. This result may indicate that findings on regional spillovers have to be interpreted with care, when only macro- or socio-economic drivers are specified. Second, our proposed model integrates various effects and drivers in a parsimonious way, enabling researchers to investigate various aspects simultaneously. Third, Moran's I seems a reasonable measure to test for spatial AC when other approaches may not be appropriate due to technical constraints. Our results indicate that the time-based lead-lag and the spatial neighborhood effect are valid instruments to reduce spatial AC in models of international diffusion when industry and marketing-mix information is not available.

With respect to future research we suggest three avenues. First, we need more investigations on the influence of industry and marketing-mix variables in international diffusion modeling to confirm and generalize our findings. Cellulars are a product that may have a common attraction across countries, i.e, the adoption decision may not interact with culture, climate or other macro-variables as for other products. Accordingly, for other products we may still find that those variables play a larger role. Second, although we find a common response to price and distribution variables across countries that should not imply that these findings hold for other products or marketing-mix instruments like advertising. Here, we need additional insights on how advertising works and interacts with culture in an international diffusion context.

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Specifications on the extensive data sources are available upon request from the authors.

Appendix A. List of Countries.

Table A1 lists all countries with their respective year of diffusion start, initial and final penetration rates, the individual time span covered and their time lag to the lead country.

Table A1. Descriptives on Countries (a)

Country Description (Part 1)	*Year of Start*	*Penetration Level*		*Periods*	*Lag to Lead Country*
		First Year	*2001*		
1 Albania	1996	0.0704	11.5098	6	16
2 Algeria	1990	0.0019	0.3290	12	10
3 American Samoa	1987	0.0984	4.9231	15	7
4 Antigua & Barbados	1989	0.0472	36.7647	13	9
5 Argentina	1989	0.0072	18.8348	13	9
6 Armenia	1996	0.0079	0.6593	6	16
7 Aruba	1993	**0.5102**	52.4752	9	13
8 Australia	1986	0.0110	57.9955	16	6
9 Austria	1985	0.1292	81.1435	17	5
10 Azerbaidjan	1994	0.0066	9.0661	8	14
11 Bahamas	1988	0.0833	20.0662	14	8
12 Bahrain	1986	0.1398	43.4348	16	6
13 Bangladesh	1992	0.0002	0.4008	10	12
14 Barbados	1990	0.0822	19.8881	12	10
15 Belarus	1993	0.0031	1.3822	9	13
16 Belgium	1986	0.0385	75.0098	16	6
17 Belize	1993	0.1949	15.3581	9	13
18 Benin	1995	0.0192	1.9892	7	15
19 Bermuda	1987	**1.0797**	21.1111	15	7
20 Bolivia	1991	0.0044	9.3640	11	11
21 Bosnia & Herzegovina	1996	0.0424	6.2656	6	16
22 Botswana	1998	**1.4715**	20.4744	4	18
23 Brazil	1990	0.0005	16.8978	12	10
24 Brunei	1989	**0.5971**	41.7683	13	9
25 Bulgaria	1993	0.0118	18.9789	9	13
26 Burkina Faso	1996	0.0051	0.6652	6	16
27 Burundi	1993	0.0060	0.4510	9	13
28 Cambodia	1989	0.0005	1.8592	13	9
29 Cameroon	1994	0.0125	2.0550	8	14
30 Canada	1985	0.0231	34.7828	17	5
31 Cape Verde	1998	0.2456	7.1429	4	18
32 Cayman Islands	1987	0.2564	34.2857	15	7
33 Central African Rep.	1995	0.0013	0.3058	7	15
34 Channel Islands	1994	**1.7066**	62.3490	8	14
35 Chile	1989	0.0379	34.6558	13	9
36 China	1987	0.0001	11.4830	15	7
37 Colombia	1994	0.1852	7.7195	8	14
38 Congo	1996	0.0380	5.1090	6	16
39 Costa Rica	1989	0.0105	8.5276	13	9
40 Cote D'Ivoire	1996	0.0947	4.5674	6	16

Table A1. Descriptives on Countries (b)

Country Description (Part 2)	Year of Start	*Penetration Level* First Year	*Penetration Level* 2001	Periods	Lag to Lead Country
41 Croatia	1990	0.0050	39.3498	12	10
42 Cyprus	1988	0.0253	41.0444	14	8
43 Czech Rep.	1991	0.0120	67.6238	11	11
44 Denmark	1982	0.1407	74.1610	20	2
45 Djibouti	1996	0.0180	0.4545	6	16
46 Dominia	1996	**0.6315**	10.5479	6	16
47 Dominican Rep.	1987	0.0029	14.8409	15	7
48 Ecuador	1993	0.0104	6.7942	9	13
49 Egypt	1987	0.0054	4.3777	15	7
50 El Salvador	1993	0.0301	13.6677	9	13
51 Estonia	1991	0.0364	45.3798	11	11
52 Ethopia	1999	0.0107	0.0428	3	19
53 Faroer Islands	1989	**0.6818**	44.4444	13	9
54 Fiji	1994	0.1437	9.9877	8	14
55 Finland	1980	0.4913	80.6100	22	0
56 France	1986	0.0163	61.0404	16	6
57 French Guyana	1995	**0.8696**	40.0638	7	15
58 French Polynesia	1995	**0.5314**	28.7966	7	15
59 Gabon	1992	0.0275	20.8650	10	12
60 Gambia	1992	0.0204	4.2846	10	12
61 Georgia	1995	0.0028	5.5183	7	15
62 Germany	1985	0.0014	68.4662	17	5
63 Ghana	1992	0.0025	1.0094	10	12
64 Gibraltar	1995	**2.4444**	29.1971	7	15
65 Greece	1993	0.4625	75.4133	9	13
66 Greenland	1992	0.3054	29.8214	10	12
67 Grenada	1990	0.1571	6.5306	12	10
68 Guadeloupe	1991	0.0256	63.3160	11	11
69 Guatemala	1990	0.0033	9.9602	12	10
70 Guinea	1993	0.0007	0.7512	9	13
71 Guyana	1992	0.1038	8.7254	10	12
72 Honduras	1996	0.0298	3.6643	6	16
73 Hong Kong	1984	0.0186	84.9733	18	4
74 Hungary	1990	0.0255	49.5650	12	10
75 Iceland	1986	**1.0872**	88.2918	16	6
76 India	1995	0.0083	0.6331	7	15
77 Indonesia	1984	0.0011	3.0990	18	4
78 Iran	1994	0.0159	3.2608	8	14
79 Ireland	1985	0.0085	78.2815	17	5
80 Israel	1986	0.0237	94.6543	16	6
81 Italy	1985	0.0113	88.8469	17	5
82 Jamaica	1991	0.1009	24.2359	11	11
83 Japan	1981	0.0113	59.0196	21	1
84 Jordan	1985	0.0040	17.7212	17	5
85 Kazakstan	1994	0.0025	3.9152	8	14
86 Kenya	1992	0.0044	1.9962	10	12
87 Kiribati	1998	0.0256	0.5513	4	18
88 South Korea	1984	0.0048	61.4460	18	4
89 Kuwait	1986	0.4578	44.2401	16	6
90 Kyrgistan	1998	0.0281	0.5474	4	18

Table A1. Descriptives on Countries (c)

Country Description (Part 3)	Year of Start	*Penetration Level* First Year	*Penetration Level* 2001	Periods	Lag to Lead Country
91 Laos	1992	0.0068	0.5656	10	12
92 Latvia	1992	0.0390	27.1753	10	12
93 Lebanon	1991	0.0109	17.7172	11	11
94 Lesotho	1996	0.0641	2.6462	6	16
95 Liechtenstein	1995	0.1938	56.2500	7	15
96 Lithuania	1992	0.0071	27.5284	10	12
97 Luxembourg	1985	0.0109	93.4018	17	5
98 Macao	1989	0.3795	44.0045	13	9
99 Macedonia	1996	0.0534	10.9946	6	16
100 Madagaskar	1994	0.0023	0.9502	8	14
101 Malawi	1995	0.0039	0.5044	7	15
102 Malaysia	1985	0.0257	32.1453	17	5
103 Maledives	1996	0.0080	6.8478	6	16
104 Mali	1996	0.0120	0.4179	6	16
105 Malta	1990	0.3388	62.6702	12	10
106 Marshall Islands	1993	0.2745	0.9615	9	13
107 Martinique	1991	0.1368	71.8844	11	11
108 Mauretania	2000	0.2673	4.2151	2	20
109 Mauritius	1989	0.0253	22.9652	13	9
110 Mexico	1988	0.0019	22.2093	14	8
111 Moldova	1995	0.0003	5.2767	7	15
112 Mongolia	1996	0.0391	8.1318	6	16
113 Morocco	1987	0.0003	16.7671	15	7
114 Mozambique	1997	0.0150	0.8666	5	17
115 Myanmar	1993	0.0015	0.0643	9	13
116 Namibia	1995	0.2268	5.7471	7	15
117 Nepal	1999	0.0235	0.0723	3	19
118 Netherlands	1985	0.0331	77.5928	17	5
119 New Caldonia	1995	0.4275	31.9309	7	15
120 New Zealand	1987	0.0724	63.2472	15	7
121 Nicaragua	1993	0.0077	3.0636	9	13
122 Nigeria	1993	0.0086	0.3152	9	13
123 Northern Marian Islands	1991	0.2899	4.3056	11	11
124 Norway	1981	0.0407	82.1282	21	1
125 Oman	1985	0.0037	13.5491	17	5
126 Pakistan	1990	0.0019	0.5881	12	10
127 Panama	1996	0.2618	16.6457	6	16
128 Papua New Guinea	1996	0.0519	0.2226	6	16
129 Paraguay	1992	0.0336	20.9243	10	12
130 Peru	1990	0.0076	7.0104	12	10
131 Philippines	1989	0.0135	15.4803	13	9
132 Poland	1992	0.0057	25.8854	10	12
133 Portugal	1989	0.0280	79.6955	13	9
134 Puerto Rico	1986	0.0151	30.8954	16	6
135 Quatar	1982	**0.7858**	30.5699	20	2
136 Reunion	1995	**0.8330**	59.6459	7	15
137 Romania	1993	0.0035	17.1388	9	13
138 Russia	1991	0.0002	5.3253	11	11
139 Rwanda	1998	0.0617	0.7640	4	18
140 Saudi Arabia	1981	0.0219	12.2018	21	1

Table A1. Descriptives on Countries (d)

Country Description (Part 4)	Year of Start	Penetration Level		Periods	Lag to Lead Country
		First Year	2001		
141 Senegal	1994	0.0012	4.1007	8	14
142 Seychelles	1995	0.0664	54.2903	7	15
143 Singapur	1984	0.2196	74.4550	18	4
144 Slovakia	1991	0.0023	39.7516	11	11
145 Slovenia	1991	0.0261	73.9487	11	11
146 Solomon Islands	1994	0.0392	0.2604	8	14
147 Somalia	2000	0.0051	0.0206	2	20
148 South Africa	1987	0.0014	25.2074	15	7
149 Spain	1986	0.0044	75.1733	16	6
150 Srilanka	1990	0.0059	3.4487	12	10
151 St. Kitts & Nevis	1990	0.0143	5.1220	12	10
152 St. Lucia	1990	0.0701	1.6026	12	10
153 St. Vincent	1990	0.0308	6.5217	12	10
154 Sudan	1996	0.0081	0.3498	6	16
155 Suriname	1993	0.2650	20.9639	9	13
156 Swaziland	1998	0.4745	5.2632	4	18
157 Sweden	1981	0.2447	79.4002	21	1
158 Switzerland	1987	0.0837	73.4791	15	7
159 Syria	1999	0.0255	1.2415	3	19
160 Taiwan	1989	0.1858	96.9036	13	9
161 Tajikistan	1996	0.0017	0.0253	6	16
162 Tanzania	1994	0.0013	1.2672	8	14
163 Thailand	1986	0.0016	12.4325	16	6
164 Togo	1997	0.0689	2.5696	5	17
165 Tonga	1995	0.1226	0.3101	7	15
166 Trinidad & Tobago	1991	0.0347	19.6849	11	11
167 Tunisia	1985	0.0008	4.0628	17	5
168 Turkey	1986	0.0007	29.9688	16	6
169 Uganda	1995	0.0091	1.4626	7	15
170 Ukraine	1993	0.0001	4.4851	9	13
171 United Arab Emirates	1982	0.1917	65.7228	20	2
172 United Kingdom	1985	0.0882	77.4738	17	5
173 United States	1984	0.0388	45.5956	18	4
174 Uruguay	1991	0.0096	15.5829	11	11
175 Uzbekistan	1993	0.0023	0.2548	9	13
176 Vanuatu	1994	0.0390	0.1827	8	14
177 Venezuela	1988	0.0098	26.8511	14	8
178 Vietnam	1992	0.0012	1.5934	10	12
179 Virgin Islands	1990	0.4568	33.8843	12	10
180 Yemen	1992	0.0112	0.8682	10	12
181 Yugoslavia	1996	0.1400	18.8188	6	16
182 Zambia	1995	0.0172	1.2013	7	15
183 Zimbabwe	1997	0.0500	2.7138	5	17

Appendix B. Factors and Items.

Sections B1-3 list the respective items from which the factors for the three aspects were derived. The description includes the respective item descriptives, the correlation matrices and the factor loadings. Before turning to the factor analysis in detail, we report the resulting factor scores based on 183 country observations.

Table B-1. Descriptives on Factor Scores

(183 observations)

Factor Scores	***Mean***	***Std. Dev.***
Culture, Langage, Religion, Ethnic Groups (CLRE)		
CLRE_1	0.0273	0.1630
CLRE_2	0.4530	0.4801
CLRE_3	0.2533	0.4148
Climate, Geography, Hazards (CGH)		
CGH_1	0.0219	0.1462
CGH_2	0.0546	0.2273
CGH_3	0.1501	0.3528
CGH_4	0.3319	0.4571
Political Situation (POL)		
POL_1	0.0164	0.1270
POL_2	0.0273	0.1630
POL_3	0.1381	0.3431
POL_4	0.2927	0.4493

B1 - Factors on Culture, Language, Religion, and Ethnic Groups.

In our sample, 25 time-invariant items describe each of the 183 countries. For the exploratory factor analysis, we use the standardized values on the Hofstede measures.

Table B1-1. Descriptives on Items

Descriptive Statistics	*Mean*	*Std. Dev.*	*Min.*	*Max.*
Power Distance Index	57.706	18.199	11.000	104.000
Power Distance Index (rel. to average)	1.000	0.315	0.191	1.802
Individualism Index	42.593	21.890	6.000	91.000
Individualism Index (rel. to average)	1.000	0.514	0.141	2.137
Masculinism Index	51.636	16.278	5.000	95.000
Masculinism Index (rel. to average)	1.000	0.315	0.097	1.840
Uncertainty Avoidance Index	58.747	21.589	8.000	112.000
Uncertainty Avoidance Index (rel. to average)	1.000	0.367	0.136	1.907
Number of Languages spoken	1.809	1.538	1	19
Native Language (Dummy)	1.022	1.537	0	18
English (Dummy)	0.284	0.452	0	1
French (Dummy)	0.148	0.356	0	1
Arabic (Dummy)	0.098	0.299	0	1
German (Dummy)	0.033	0.179	0	1
Spanish (Dummy)	0.115	0.320	0	1
Portugese (Dummy)	0.027	0.163	0	1
Dutch (Dummy)	0.022	0.147	0	1
Russian (Dummy)	0.060	0.238	0	1
Total Number of Religions	1.333	0.596	1	3
Religion - Native (Dummy)	0.126	0.332	0	1
Religion - Christian (Dummy)	0.776	0.418	0	1
Religion - Islam (Dummy)	0.284	0.452	0	1
Religion - Buddhism (Dummy)	0.082	0.275	0	1
Religion - Hindu (Dummy)	0.038	0.192	0	1
Religion - Confucian (Dummy)	0.016	0.127	0	1
Religion - Jewish (Dummy)	0.005	0.074	0	1
Religion - Shintoism (Dummy)	0.005	0.074	0	1
Total Number of Ethinc Groups	7.934	19.975	1.000	250
Share of largest Ethnic Group	0.697	0.216	0.060	1

Table B1-2. Correlation Matrix of Items (a)

Correlations	*Power Distance Index*	*Power Distance Index - relative to avg*	*Individualism Index*	*Individualism Index - relative to avg*	*Masculinism Index*	*Masculinism Index - relative to avg*	*Uncertainty Avoidance Index*	*Uncertainty Avoidance Index - relative to avg*
Power Distance Index	1.000	**1.000**	**-0.690**	**-0.690**	-0.028	-0.028	**0.224**	**0.224**
		0.000	*0.000*	*0.000*	*0.708*	*0.708*	*0.002*	*0.002*
Power Distance Index (relative to average)	**1.000**	1.000	**-0.690**	**-0.690**	-0.028	-0.028	**0.225**	**0.225**
	0.000		*0.000*	*0.000*	*0.708*	*0.708*	*0.002*	*0.002*
Individualism Index	**-0.690**	**-0.690**	1.000	**1.000**	**0.177**	**0.177**	**-0.186**	**-0.186**
	0.000	*0.000*		*0.000*	*0.016*	*0.016*	*0.012*	*0.012*
Individualism Index (relative to average)	-0.690	**-0.690**	**1.000**	1.000	**0.177**	**0.177**	**-0.186**	**-0.186**
	0.000	*0.000*	*0.000*		*0.016*	*0.016*	*0.012*	*0.012*
Masculinism Index	-0.028	-0.028	**0.177**	**0.177**	1.000	**1.000**	0.044	0.044
	0.708	*0.708*	*0.016*	*0.016*		*0.000*	*0.551*	*0.551*
Masculinism Index (relative to average)	-0.028	-0.028	**0.177**	**0.177**	**1.000**	1.000	0.044	0.044
	0.708	*0.708*	*0.016*	*0.016*	*0.000*		*0.551*	*0.551*
Uncertainty Avoidance Index	**0.224**	**0.225**	**-0.186**	**-0.186**	0.044	0.044	1.000	**1.000**
	0.002	*0.002*	*0.012*	*0.012*	*0.551*	*0.551*		*0.000*
Uncertainty Avoidance Index (relative to average)	**0.224**	**0.225**	**-0.186**	**-0.186**	0.044	0.044	**1.000**	1.000
	0.002	*0.002*	*0.012*	*0.012*	*0.551*	*0.551*	*0.000*	
Number of Languages spoken	0.131	0.131	-0.030	-0.030	-0.032	-0.032	-0.134	-0.134
	0.078	*0.078*	*0.683*	*0.683*	*0.669*	*0.669*	*0.070*	*0.070*
Dummy Native Language	0.109	0.109	-0.043	-0.043	-0.052	-0.052	-0.114	-0.114
	0.142	*0.142*	*0.567*	*0.567*	*0.484*	*0.484*	*0.124*	*0.124*
Dummy English	**-0.202**	**-0.202**	**0.224**	**0.224**	**0.177**	**0.177**	**-0.429**	**-0.429**
	0.006	*0.006*	*0.002*	*0.002*	*0.017*	*0.017*	*0.000*	*0.000*
Dummy French	**0.185**	**0.185**	-0.145	-0.145	-0.059	-0.059	-0.064	-0.064
	0.012	*0.012*	*0.051*	*0.051*	*0.425*	*0.425*	*0.386*	*0.386*
Dummy Arabic	**0.322**	**0.322**	-0.065	-0.065	-0.011	-0.011	0.139	0.139
	0.000	*0.000*	*0.380*	*0.380*	*0.886*	*0.886*	*0.060*	*0.060*
Dummy German	**-0.242**	**-0.242**	**0.183**	**0.183**	**0.184**	**0.184**	0.041	0.041
	0.001	*0.001*	*0.013*	*0.013*	*0.013*	*0.013*	*0.578*	*0.578*
Dummy Spanish	0.127	0.127	**-0.207**	**-0.207**	-0.049	-0.049	**0.334**	**0.334**
	0.086	*0.086*	*0.005*	*0.005*	*0.506*	*0.506*	*0.000*	*0.000*
Dummy Portugese	0.097	0.097	-0.117	-0.117	-0.071	-0.071	0.033	0.033
	0.192	*0.192*	*0.116*	*0.116*	*0.342*	*0.343*	*0.656*	*0.656*
Dummy Dutch	-0.031	-0.030	**0.153**	**0.153**	**-0.146**	**-0.146**	0.071	0.071
	0.682	*0.683*	*0.038*	*0.038*	*0.048*	*0.048*	*0.338*	*0.338*
Dummy Russian	**-0.192**	**-0.192**	0.077	0.077	-0.036	-0.036	0.058	0.058
	0.009	*0.009*	*0.300*	*0.300*	*0.630*	*0.630*	*0.439*	*0.439*
Total Number of Religions	**0.322**	**0.321**	**-0.358**	**-0.358**	-0.081	-0.081	-0.021	-0.021
	0.000	*0.000*	*0.000*	*0.000*	*0.273*	*0.273*	*0.778*	*0.778*
Dummy Religion - Native	**0.265**	**0.265**	**-0.312**	**-0.312**	**-0.160**	**-0.160**	-0.053	-0.053
	0.000	*0.000*	*0.000*	*0.000*	*0.030*	*0.030*	*0.476*	*0.476*
Dummy Religion - Christian	**-0.459**	**-0.458**	**0.258**	**0.258**	0.063	0.063	-0.034	-0.034
	0.000	*0.000*	*0.000*	*0.000*	*0.397*	*0.397*	*0.651*	*0.651*
Dummy Religion - Islam	**0.447**	**0.447**	**-0.287**	**-0.287**	-0.048	-0.048	0.082	0.082
	0.000	*0.000*	*0.000*	*0.000*	*0.517*	*0.517*	*0.268*	*0.268*
Dummy Reiligion - Buddhism	**0.205**	**0.205**	**-0.238**	**-0.238**	-0.060	-0.060	-0.076	-0.076
	0.005	*0.005*	*0.001*	*0.001*	*0.423*	*0.423*	*0.306*	*0.306*
Dummy Religion - Hindu	**0.156**	**0.156**	-0.046	-0.046	0.037	0.037	-0.038	-0.038
	0.035	*0.035*	*0.540*	*0.540*	*0.621*	*0.621*	*0.608*	*0.608*
Dummy Religion - Confucian	**0.168**	**0.168**	-0.136	-0.136	-0.029	-0.029	-0.030	-0.030
	0.023	*0.023*	*0.067*	*0.067*	*0.698*	*0.698*	*0.682*	*0.682*
Dummy Religion - Jewish	**-0.183**	**-0.183**	0.039	0.039	-0.021	-0.021	0.077	0.077
	0.013	*0.013*	*0.603*	*0.603*	*0.776*	*0.776*	*0.303*	*0.303*
Dummy Religion - Shintoism	-0.015	-0.015	0.012	0.012	**0.198**	**0.198**	0.114	0.114
	0.839	*0.839*	*0.876*	*0.876*	*0.007*	*0.007*	*0.123*	*0.123*
Total Number of Ethinc Groups	0.136	0.136	**-0.146**	**-0.146**	-0.032	-0.032	-0.033	-0.033
	0.065	*0.065*	*0.049*	*0.049*	*0.668*	*0.668*	*0.659*	*0.659*
Share of largest Ethnic Group	**-0.245**	**-0.245**	**0.211**	**0.211**	0.052	0.052	0.040	0.040
	0.001	*0.001*	*0.004*	*0.004*	*0.485*	*0.485*	*0.586*	*0.587*

Correlation at sig.-level .05
Sig. Level (2-sided)

Table B1-2. Correlation Matrix of Items (b)

Correlations	*Number of Languages spoken*	*Dummy Native Language*	*Dummy English*	*Dummy French*	*Dummy Arabic*	*Dummy German*	*Dummy Spanish*	*Dummy Portugese*	*Dummy Dutch*	*Dummy Russian*
Power Distance Index	0.131	0.109	**-0.202**	**0.185**	**0.322**	**-0.242**	0.127	0.097	-0.031	**-0.192**
	0.078	*0.142*	*0.006*	*0.012*	*0.000*	*0.001*	*0.086*	*0.192*	*0.682*	*0.009*
Power Distance Index (relative to average)	0.131	0.109	**-0.202**	**0.185**	**0.322**	**-0.242**	0.127	0.097	-0.030	**-0.192**
	0.078	*0.142*	*0.006*	*0.012*	*0.000*	*0.001*	*0.086*	*0.192*	*0.683*	*0.009*
Individualism Index	-0.030	-0.043	**0.224**	-0.145	-0.065	**0.183**	**-0.207**	-0.117	**0.153**	0.077
	0.683	*0.567*	*0.002*	*0.051*	*0.380*	*0.013*	*0.005*	*0.116*	*0.038*	*0.300*
Individualism Index (relative to average)	-0.030	-0.043	**0.224**	-0.145	-0.065	**0.183**	**-0.207**	-0.117	**0.153**	0.077
	0.683	*0.567*	*0.002*	*0.051*	*0.380*	*0.013*	*0.005*	*0.116*	*0.038*	*0.300*
Masculinism Index	-0.032	-0.052	**0.177**	-0.059	-0.011	**0.184**	-0.049	-0.071	**-0.146**	-0.036
	0.669	*0.484*	*0.017*	*0.425*	*0.886*	*0.013*	*0.506*	*0.342*	*0.048*	*0.630*
Masculinism Index (relative to average)	-0.032	-0.052	**0.177**	-0.059	-0.011	**0.184**	-0.049	-0.071	**-0.146**	-0.036
	0.669	*0.484*	*0.017*	*0.425*	*0.886*	*0.013*	*0.506*	*0.343*	*0.048*	*0.630*
Uncertainty Avoidance Index	-0.134	-0.114	**-0.429**	-0.064	0.139	0.041	**0.334**	0.033	0.071	0.058
	0.070	*0.124*	*0.000*	*0.386*	*0.060*	*0.578*	*0.000*	*0.656*	*0.338*	*0.439*
Uncertainty Avoidance Index (relative to average)	-0.134	-0.114	**-0.429**	-0.064	0.139	0.041	**0.334**	0.033	0.071	0.058
	0.070	*0.124*	*0.000*	*0.386*	*0.060*	*0.578*	*0.000*	*0.656*	*0.338*	*0.439*
Number of Languages spoken	1.000	**0.941**	**0.252**	0.092	-0.090	0.023	-0.112	-0.023	-0.006	0.032
		0.000	*0.001*	*0.215*	*0.223*	*0.758*	*0.132*	*0.759*	*0.939*	*0.672*
Dummy Native Language	**0.941**	1.000	0.125	-0.056	**-0.160**	-0.043	**-0.173**	-0.046	-0.051	-0.004
	0.000		*0.091*	*0.450*	*0.030*	*0.566*	*0.019*	*0.535*	*0.494*	*0.961*
Dummy English	**0.252**	0.125	1.000	-0.125	**-0.208**	-0.048	**-0.227**	-0.106	-0.094	**-0.159**
	0.001	*0.091*		*0.091*	*0.005*	*0.519*	*0.002*	*0.155*	*0.205*	*0.031*
Dummy French	0.092	-0.056	-0.125	1.000	-0.034	0.010	-0.101	-0.070	0.043	-0.105
	0.215	*0.450*	*0.091*		*0.648*	*0.894*	*0.172*	*0.348*	*0.562*	*0.156*
Dummy Arabic	-0.090	**-0.160**	**-0.208**	-0.034	1.000	-0.061	-0.119	-0.055	-0.049	-0.084
	0.223	*0.030*	*0.005*	*0.648*		*0.413*	*0.109*	*0.457*	*0.507*	*0.261*
Dummy German	0.023	-0.043	-0.048	0.010	-0.061	1.000	-0.066	-0.031	-0.028	-0.047
	0.758	*0.566*	*0.519*	*0.894*	*0.413*		*0.373*	*0.678*	*0.712*	*0.531*
Dummy Spanish	-0.112	**-0.173**	**-0.227**	-0.101	-0.119	-0.066	1.000	-0.060	-0.054	-0.091
	0.132	*0.019*	*0.002*	*0.172*	*0.109*	*0.373*		*0.417*	*0.469*	*0.220*
Dummy Portugese	-0.023	-0.046	-0.106	-0.070	-0.055	-0.031	-0.060	1.000	-0.025	-0.042
	0.759	*0.535*	*0.155*	*0.348*	*0.457*	*0.678*	*0.417*		*0.736*	*0.569*
Dummy Dutch	-0.006	-0.051	-0.094	0.043	-0.049	-0.028	-0.054	-0.025	1.000	-0.038
	0.939	*0.494*	*0.205*	*0.562*	*0.507*	*0.712*	*0.469*	*0.736*		*0.611*
Dummy Russian	0.032	-0.004	**-0.159**	-0.105	-0.084	-0.047	-0.091	-0.042	-0.038	1.000
	0.672	*0.961*	*0.031*	*0.156*	*0.261*	*0.531*	*0.220*	*0.569*	*0.611*	
Total Number of Religions	**0.238**	**0.238**	0.034	**0.156**	-0.062	-0.103	**-0.173**	0.075	0.042	0.013
	0.001	*0.001*	*0.648*	*0.036*	*0.406*	*0.164*	*0.019*	*0.312*	*0.573*	*0.862*
Dummy Religion - Native	0.112	0.081	0.054	**0.307**	-0.070	-0.070	-0.085	0.038	-0.057	-0.096
	0.132	*0.278*	*0.472*	*0.000*	*0.347*	*0.348*	*0.254*	*0.614*	*0.446*	*0.197*
Dummy Religion - Christian	-0.084	**-0.155**	**0.280**	0.002	**-0.527**	0.099	**0.193**	0.090	0.080	0.136
	0.258	*0.036*	*0.000*	*0.981*	*0.000*	*0.183*	*0.009*	*0.225*	*0.280*	*0.067*
Dummy Religion - Islam	**0.189**	**0.181**	**-0.182**	0.080	**0.524**	-0.116	**-0.227**	-0.031	-0.011	0.045
	0.010	*0.014*	*0.014*	*0.285*	*0.000*	*0.118*	*0.002*	*0.674*	*0.879*	*0.549*
Dummy Reiligion - Buddhism	-0.067	0.061	-0.144	-0.124	-0.099	-0.055	-0.108	0.072	-0.045	-0.076
	0.370	*0.414*	*0.052*	*0.094*	*0.184*	*0.459*	*0.147*	*0.332*	*0.548*	*0.309*
Dummy Religion - Hindu	**0.415**	**0.406**	0.127	-0.003	-0.066	-0.037	-0.072	-0.033	**0.165**	-0.050
	0.000	*0.000*	*0.087*	*0.972*	*0.376*	*0.622*	*0.334*	*0.653*	*0.026*	*0.498*
Dummy Religion - Confucian	-0.040	0.026	-0.081	-0.054	-0.043	-0.024	-0.046	-0.022	-0.019	-0.033
	0.591	*0.724*	*0.274*	*0.470*	*0.567*	*0.749*	*0.532*	*0.771*	*0.795*	*0.661*
Dummy Religion - Jewish	0.009	-0.001	-0.047	-0.031	**0.224**	-0.014	-0.027	-0.012	-0.011	-0.019
	0.901	*0.989*	*0.530*	*0.679*	*0.002*	*0.855*	*0.720*	*0.867*	*0.882*	*0.801*
Dummy Religion - Shintoism	-0.039	-0.001	-0.047	-0.031	-0.024	-0.014	-0.027	-0.012	-0.011	-0.019
	0.599	*0.989*	*0.530*	*0.679*	*0.742*	*0.855*	*0.720*	*0.867*	*0.882*	*0.801*
Total Number of Ethinc Groups	**0.211**	**0.213**	0.068	0.038	-0.053	-0.019	-0.063	-0.021	-0.020	-0.006
	0.004	*0.004*	*0.362*	*0.612*	*0.474*	*0.794*	*0.394*	*0.774*	*0.787*	*0.935*
Share of largest Ethnic Group	**-0.236**	**-0.145**	-0.059	**-0.235**	**-0.192**	0.076	0.011	0.111	-0.036	-0.010
	0.001	*0.051*	*0.424*	*0.001*	*0.009*	*0.305*	*0.882*	*0.134*	*0.629*	*0.897*

Correlation at sig.-level .05
Sig. Level (2-sided)

Table B1-2. Correlation Matrix of Items (c)

Correlations	*Total Number of Religions*	*Dummy Religion - Native*	*Dummy Religion - Christian*	*Dummy Religion - Islam*	*Dummy Reiligion - Buddhism*	*Dummy Religion - Hindu*	*Dummy Religion - Confucian*	*Dummy Religion - Jewish*	*Dummy Religion - Shintoism*
Power Distance Index	**0.322**	**0.265**	**-0.459**	**0.447**	**0.205**	**0.156**	**0.168**	**-0.183**	-0.015
	0.000	*0.000*	*0.000*	*0.000*	*0.005*	*0.035*	*0.023*	*0.013*	*0.839*
Power Distance Index (relative to average)	**0.321**	**0.265**	**-0.458**	**0.447**	**0.205**	**0.156**	**0.168**	**-0.183**	-0.015
	0.000	*0.000*	*0.000*	*0.000*	*0.005*	*0.035*	*0.023*	*0.013*	*0.839*
Individualism Index	**-0.358**	**-0.312**	**0.258**	**-0.287**	**-0.238**	-0.046	-0.136	0.039	0.012
	0.000	*0.000*	*0.000*	*0.000*	*0.001*	*0.540*	*0.067*	*0.603*	*0.876*
Individualism Index (relative to average)	**-0.358**	**-0.312**	**0.258**	**-0.287**	**-0.238**	-0.046	-0.136	0.039	0.012
	0.000	*0.000*	*0.000*	*0.000*	*0.001*	*0.540*	*0.067*	*0.603*	*0.876*
Masculinism Index	-0.081	**-0.160**	0.063	-0.048	-0.060	0.037	-0.029	-0.021	**0.198**
	0.273	*0.030*	*0.397*	*0.517*	*0.423*	*0.621*	*0.698*	*0.776*	*0.007*
Masculinism Index (relative to average)	-0.081	**-0.160**	0.063	-0.048	-0.060	0.037	-0.029	-0.021	**0.198**
	0.273	*0.030*	*0.397*	*0.517*	*0.423*	*0.621*	*0.698*	*0.776*	*0.007*
Uncertainty Avoidance Index	-0.021	-0.053	-0.034	0.082	-0.076	-0.038	-0.030	0.077	0.114
	0.778	*0.476*	*0.651*	*0.268*	*0.306*	*0.608*	*0.682*	*0.303*	*0.123*
Uncertainty Avoidance Index (relative to average)	-0.021	-0.053	-0.034	0.082	-0.076	-0.038	-0.030	0.077	0.114
	0.778	*0.476*	*0.651*	*0.268*	*0.306*	*0.608*	*0.682*	*0.303*	*0.123*
Number of Languages spoken	**0.238**	0.112	-0.084	**0.189**	-0.067	**0.415**	-0.040	0.009	-0.039
	0.001	*0.132*	*0.258*	*0.010*	*0.370*	*0.000*	*0.591*	*0.901*	*0.599*
Dummy Native Language	**0.238**	0.081	**-0.155**	**0.181**	0.061	**0.406**	0.026	-0.001	-0.001
	0.001	*0.278*	*0.036*	*0.014*	*0.414*	*0.000*	*0.724*	*0.989*	*0.989*
Dummy English	0.034	0.054	**0.280**	**-0.182**	-0.144	0.127	-0.081	-0.047	-0.047
	0.648	*0.472*	*0.000*	*0.014*	*0.052*	*0.087*	*0.274*	*0.530*	*0.530*
Dummy French	**0.156**	**0.307**	0.002	0.080	-0.124	-0.003	-0.054	-0.031	-0.031
	0.036	*0.000*	*0.981*	*0.285*	*0.094*	*0.972*	*0.470*	*0.679*	*0.679*
Dummy Arabic	-0.062	-0.070	**-0.527**	**0.524**	-0.099	-0.066	-0.043	**0.224**	-0.024
	0.406	*0.347*	*0.000*	*0.000*	*0.184*	*0.376*	*0.567*	*0.002*	*0.742*
Dummy German	-0.103	-0.070	0.099	-0.116	-0.055	-0.037	-0.024	-0.014	-0.014
	0.164	*0.348*	*0.183*	*0.118*	*0.459*	*0.622*	*0.749*	*0.855*	*0.855*
Dummy Spanish	**-0.173**	-0.085	**0.193**	**-0.227**	-0.108	-0.072	-0.046	-0.027	-0.027
	0.019	*0.254*	*0.009*	*0.002*	*0.147*	*0.334*	*0.532*	*0.720*	*0.720*
Dummy Portugese	0.075	0.038	0.090	-0.031	0.072	-0.033	-0.022	-0.012	-0.012
	0.312	*0.614*	*0.225*	*0.674*	*0.332*	*0.653*	*0.771*	*0.867*	*0.867*
Dummy Dutch	0.042	-0.057	0.080	-0.011	-0.045	**0.165**	-0.019	-0.011	-0.011
	0.573	*0.446*	*0.280*	*0.879*	*0.548*	*0.026*	*0.795*	*0.882*	*0.882*
Dummy Russian	0.013	-0.096	0.136	0.045	-0.076	-0.050	-0.033	-0.019	-0.019
	0.862	*0.197*	*0.067*	*0.549*	*0.309*	*0.498*	*0.661*	*0.801*	*0.801*
Total Number of Religions	1.000	**0.619**	0.059	**0.380**	**0.302**	**0.320**	**0.290**	0.083	0.083
		0.000	*0.429*	*0.000*	*0.000*	*0.000*	*0.000*	*0.263*	*0.263*
Dummy Religion - Native	**0.619**	1.000	0.085	0.054	0.007	-0.076	-0.049	-0.028	-0.028
	0.000		*0.252*	*0.472*	*0.926*	*0.309*	*0.511*	*0.706*	*0.706*
Dummy Religion - Christian	0.059	0.085	1.000	**-0.562**	**-0.365**	-0.098	-0.137	-0.138	-0.138
	0.429	*0.252*		*0.000*	*0.000*	*0.188*	*0.064*	*0.063*	*0.063*
Dummy Religion - Islam	**0.380**	0.054	**-0.562**	1.000	-0.100	0.064	0.014	0.118	-0.047
	0.000	*0.472*	*0.000*		*0.178*	*0.390*	*0.850*	*0.113*	*0.530*
Dummy Reiligion - Buddhism	**0.302**	0.007	**-0.365**	-0.100	1.000	**0.148**	**0.432**	-0.022	**0.248**
	0.000	*0.926*	*0.000*	*0.178*		*0.045*	*0.000*	*0.766*	*0.001*
Dummy Religion - Hindu	**0.320**	-0.076	-0.098	0.064	**0.148**	1.000	-0.026	-0.015	-0.015
	0.000	*0.309*	*0.188*	*0.390*	*0.045*		*0.729*	*0.843*	*0.843*
Dummy Religion - Confucian	**0.290**	-0.049	-0.137	0.014	**0.432**	-0.026	1.000	-0.010	-0.010
	0.000	*0.511*	*0.064*	*0.850*	*0.000*	*0.729*		*0.898*	*0.898*
Dummy Religion - Jewish	0.083	-0.028	-0.138	0.118	-0.022	-0.015	-0.010	1.000	-0.005
	0.263	*0.706*	*0.063*	*0.113*	*0.766*	*0.843*	*0.898*		*0.941*
Dummy Religion - Shintoism	0.083	-0.028	-0.138	-0.047	**0.248**	-0.015	-0.010	-0.005	1.000
	0.263	*0.706*	*0.063*	*0.530*	*0.001*	*0.843*	*0.898*	*0.941*	
Total Number of Ethinc Groups	**0.238**	**0.252**	-0.004	**0.157**	-0.029	-0.005	-0.008	-0.011	-0.007
	0.001	*0.001*	*0.960*	*0.034*	*0.697*	*0.946*	*0.912*	*0.883*	*0.923*
Share of largest Ethnic Group	**-0.223**	**-0.179**	0.124	**-0.308**	0.134	**-0.156**	0.073	-0.129	0.101
	0.002	*0.015*	*0.093*	*0.000*	*0.071*	*0.035*	*0.329*	*0.081*	*0.174*

Correlation at sig.-level .05
Sig. Level (2-sided)

Table B1-2. Correlation Matrix of Items (d)

Correlations	*Total Number of Ethinc Groups*	*Share of largest Ethnic Group*
Power Distance Index	**0.136**	**-0.245**
	0.065	*0.001*
Power Distance Index (relative to average)	**0.136**	**-0.245**
	0.065	*0.001*
Individualism Index	**-0.146**	**0.211**
	0.049	*0.004*
Individualism Index (relative to average)	**-0.146**	**0.211**
	0.049	*0.004*
Masculinism Index	-0.032	0.052
	0.668	*0.485*
Masculinism Index (relative to average)	-0.032	0.052
	0.668	*0.485*
Uncertainty Avoidance Index	-0.033	0.040
	0.659	*0.586*
Uncertainty Avoidance Index (relative to average)	-0.033	0.040
	0.659	*0.587*
Number of Languages spoken	**0.211**	**-0.236**
	0.004	*0.001*
Dummy Native Language	**0.213**	-0.145
	0.004	*0.051*
Dummy English	0.068	-0.059
	0.362	*0.424*
Dummy French	0.038	**-0.235**
	0.612	*0.001*
Dummy Arabic	-0.053	**-0.192**
	0.474	*0.009*
Dummy German	-0.019	0.076
	0.794	*0.305*
Dummy Spanish	-0.063	0.011
	0.394	*0.882*
Dummy Portugese	-0.021	0.111
	0.774	*0.134*
Dummy Dutch	-0.020	-0.036
	0.787	*0.629*
Dummy Russian	-0.006	-0.010
	0.935	*0.897*
Total Number of Religions	**0.238**	**-0.223**
	0.001	*0.002*
Dummy Religion - Native	**0.252**	**-0.179**
	0.001	*0.015*
Dummy Religion - Christian	-0.004	0.124
	0.960	*0.093*
Dummy Religion - Islam	**0.157**	**-0.308**
	0.034	*0.000*
Dummy Reiligion - Buddhism	-0.029	0.134
	0.697	*0.071*
Dummy Religion - Hindu	-0.005	**-0.156**
	0.946	*0.035*
Dummy Religion - Confucian	-0.008	0.073
	0.912	*0.329*
Dummy Religion - Jewish	-0.011	-0.129
	0.883	*0.081*
Dummy Religion - Shintoism	-0.007	0.101
	0.923	*0.174*
Total Number of Ethinc Groups	1.000	**-0.218**
		0.003
Share of largest Ethnic Group	**-0.218**	1.000
	0.003	

Correlation at sig.-level .05
Sig. Level (2-sided)

Table B1-3. Selection of Factor Model

LC Factor Model (Culture, Language, Religion, Ethnic Groups)	*LL*	*BIC (LL)*	*# Parameters*	*Class. Error*
2-DFactor(2,2)	-2,163	4,816	94	0.0000
3-DFactor(2,2,2)*	**-2,008**	**4,663**	**124**	**0.0000**
4-DFactor(2,2,2,2)	-1,950	4,702	154	0.0000
5-DFactor(2,2,2,2,2)	-1,871	4,701	184	0.0000

** With -2LL=309.6086 Difference to 2-DFactor model at p=.00 level n. sig.*

Table B1-4. Factor Loadings

Factor Loadings (Culture, Language, Religion, Ethnic Groups)	*DFactor 1*	*DFactor 2*	*DFactor 3*	*R^2*
Power Distance Index (rel. to average)	0.0904	0.5819	0.4439	0.5439
Individualism Index (rel. to average)	-0.1304	-0.4916	-0.2975	0.3472
Masculinism Index (rel. to average)	-0.0485	-0.1111	-0.0901	0.0228
Uncertainty Avoidance Index (rel. to average)	-0.1396	0.0383	0.4144	0.1927
Number of Languages spoken	0.2170	0.1797	-0.1561	0.1063
Native Language (Dummy)	0.1753	0.1660	0.3708	0.2146
English (Dummy)	0.1440	0.1658	0.3718	0.2025
French (Dummy)	0.1978	0.0546	0.0183	0.0426
Arabic (Dummy)	0.0547	0.3591	0.5112	0.7239
German (Dummy)	0.0105	0.1667	0.1065	0.0487
Spanish (Dummy)	0.0660	0.3473	0.5804	0.7592
Portugese (Dummy)	0.0262	0.1104	0.0182	0.0136
Dutch (Dummy)	0.0232	0.0599	0.0235	0.0049
Russian (Dummy)	0.0303	0.0140	0.1450	0.0225
Total Number of Religions	0.3160	0.4872	-0.2078	0.3883
Religion - Native (Dummy)	0.3766	0.2302	0.1045	0.2111
Religion - Christian (Dummy)	0.0274	0.5832	0.2598	0.4883
Religion - Islam (Dummy)	0.0799	0.6723	0.2324	0.5739
Religion - Buddhism (Dummy)	0.0446	0.3266	0.1728	0.1780
Religion - Hindu (Dummy)	0.0298	0.2178	0.1154	0.0792
Religion - Confucian (Dummy)	0.0193	0.1411	0.0747	0.0332
Religion - Jewish (Dummy)	0.0111	0.0810	0.0428	0.0109
Religion - Shintoism (Dummy)	0.0111	0.0810	0.0429	0.0110
Total Number of Ethnic Groups	0.9068	0.0955	-0.0986	0.9479
Share of largest Ethnic Group	-0.1426	-0.2958	-0.0797	0.1142

B2 - Factors on Climate, Geography, and Hazards.

In our sample, 46 time-invariant items describe each of the 183 countries.

Table B2-1. Descriptives on Items

Descriptive Statistics	*Mean*	*Std. Dev.*	*Min.*	*Max.*
Forrested Land	0.286	0.223	0.000	0.905
Arable Land	0.144	0.141	0.000	0.730
Highest Elevation (m)	2,618.710	2,027.385	3	8,850
Lowest Elevation (m)	33.530	174.302	-408	1,400
Average Elevation (m)	615.178	557.060	1	2,750
Elevation above 4000m	0.011	0.049	0.00	0.30
Elevation above 2000m	0.058	0.115	0.00	0.60
Elevation above 1000m	0.108	0.137	0.00	0.80
Elevation above 400m (Uplands)	0.226	0.200	0.00	0.90
Elevation High Plateau	0.045	0.155	0.00	0.90
Elevation Low Plains	0.549	0.333	0.00	1.00
Elevation Depression	0.003	0.019	0.00	0.20
Land Area (sqkm)	656,953.797	1,914,958.233	6.5	16,888,500
Landlocked (1/0)	0.191	0.394	0	1
Island (1/0)	0.230	0.422	0	1
Number of different climate zones (1-14)	2.590	2.041	1	10
Climate - Af (moist)	0.137	0.344	0	1
Climate - Am (Monsoon)	0.426	0.496	0	1
Climate - Aw (Dry Season)	0.153	0.361	0	1
Climate - Bs (Steppe)	0.301	0.460	0	1
Climate - Bw (Desert)	0.240	0.429	0	1
Climate - C (Temperate)	0.093	0.291	0	1
Climate - Cw (Winter Dry)	0.257	0.438	0	1
Climate - Cs (Summer Dry)	0.180	0.386	0	1
Climate - Cf (Moist)	0.191	0.394	0	1
Climate - D (Cold)	0.158	0.366	0	1
Climate - Df (Moist)	0.213	0.411	0	1
Climate - Dw (Winter Dry)	0.104	0.306	0	1
Climate - ET (Tundra)	0.148	0.356	0	1
Climate - EF (Arctic)	0.071	0.258	0	1
Number of different Hazards (0-15)	1.891	1.441	0	8
Hazard - Earthquakes	0.311	0.464	0	1
Hazard - Tsunamis	0.060	0.238	0	1
Hazard - Floods	0.344	0.476	0	1
Hazard - Mudslides	0.120	0.326	0	1
Hazard - Droughts	0.311	0.464	0	1
Hazard - Forest Fires	0.049	0.217	0	1
Hazard - Storms	0.049	0.217	0	1
Hazard - Hurricanes	0.137	0.344	0	1
Hazard - Typhoons	0.082	0.275	0	1
Hazard - Cyclones	0.087	0.283	0	1
Hazard - Tornados	0.011	0.104	0	1
Hazard - Blizzards	0.005	0.074	0	1
Hazard - Avalanches	0.033	0.179	0	1
Hazard - Dust Storms	0.126	0.332	0	1
Hazard - Volcanoes	0.164	0.371	0	1

Table B2-2. Correlation Matrix of Items (a)

Correlations	*Forrested Land (%)*	*Arable Land (%)*	*Land Area (sqkm)*	*Landlocked (1/0)*	*Island (1/0)*	*Highest Elevation (m)*	*Lowest Elevation (m)*	*Average Elevation (m)*	*Elevation above 4000m (%)*	*Elevation above 2000m (%)*	*Elevation above 1000m (%)*	*Elevation above 400m (Uplands) (%)*	*Elevation High Plateau (%)*	*Elevation Low Plains (%)*	*Elevation Depression (%)*
Forrested Land (%)	1.000	**-0.160**	0.025	-0.078	0.002	0.007	-0.050	-0.113	-0.103	-0.081	-0.041	0.134	-0.040	0.006	-0.134
		0.030	*0.740*	*0.291*	*0.973*	*0.926*	*0.501*	*0.127*	*0.166*	*0.277*	*0.583*	*0.071*	*0.588*	*0.935*	*0.070*
Arable Land (%)	**-0.160**	1.000	-0.098	0.083	**-0.167**	-0.033	0.034	-0.063	-0.046	-0.037	-0.022	0.022	-0.048	0.038	-0.010
	0.030		*0.189*	*0.266*	*0.024*	*0.661*	*0.650*	*0.400*	*0.537*	*0.618*	*0.773*	*0.773*	*0.521*	*0.606*	*0.889*
Land Area (sqkm)	0.025	-0.098	1.000	-0.074	-0.122	**0.381**	-0.093	0.023	0.140	0.010	0.066	0.074	-0.015	-0.090	0.008
	0.740	*0.189*		*0.321*	*0.100*	*0.000*	*0.210*	*0.758*	*0.059*	*0.889*	*0.374*	*0.321*	*0.842*	*0.228*	*0.909*
Landlocked (1/0)	-0.078	0.083	-0.074	1.000	**-0.265**	**0.163**	**0.513**	**0.461**	0.140	**0.334**	**0.176**	0.035	**0.237**	**-0.348**	**0.147**
	0.291	*0.266*	*0.321*		*0.000*	*0.028*	*0.000*	*0.000*	*0.058*	*0.000*	*0.017*	*0.640*	*0.001*	*0.000*	*0.048*
Island (1/0)	0.002	**-0.167**	-0.122	**-0.265**	1.000	**-0.316**	-0.106	**-0.290**	-0.101	**-0.210**	-0.097	-0.116	-0.116	**0.256**	-0.077
	0.973	*0.024*	*0.100*	*0.000*		*0.000*	*0.152*	*0.000*	*0.176*	*0.004*	*0.192*	*0.119*	*0.117*	*0.000*	*0.300*
Highest Elevation (m)	0.007	-0.033	**0.381**	**0.163**	**-0.316**	1.000	0.087	**0.681**	**0.546**	**0.575**	**0.415**	0.140	0.069	**-0.573**	0.094
	0.926	*0.661*	*0.000*	*0.028*	*0.000*		*0.241*	*0.000*	*0.000*	*0.000*	*0.000*	*0.058*	*0.355*	*0.000*	*0.207*
Lowest Elevation (m)	-0.050	0.034	-0.093	**0.513**	-0.106	0.087	1.000	**0.424**	0.020	**0.477**	**0.238**	**-0.158**	**0.369**	**-0.334**	**-0.146**
	0.501	*0.650*	*0.210*	*0.000*	*0.152*	*0.241*		*0.000*	*0.790*	*0.000*	*0.001*	*0.032*	*0.000*	*0.000*	*0.049*
Average Elevation (m)	-0.113	-0.063	0.023	**0.461**	**-0.290**	**0.681**	**0.424**	1.000	**0.469**	**0.692**	**0.501**	0.055	**0.252**	**-0.678**	**0.194**
	0.127	*0.400*	*0.758*	*0.000*	*0.000*	*0.000*	*0.000*		*0.000*	*0.000*	*0.000*	*0.458*	*0.001*	*0.000*	*0.008*
Elevation above 4000m (%)	-0.103	-0.046	0.140	0.140	-0.101	**0.546**	0.020	**0.469**	1.000	**0.461**	0.100	-0.074	-0.067	**-0.271**	-0.033
	0.166	*0.537*	*0.059*	*0.058*	*0.176*	*0.000*	*0.790*	*0.000*		*0.000*	*0.177*	*0.318*	*0.365*	*0.000*	*0.659*
Elevation above 2000m (%)	-0.081	-0.037	0.010	**0.334**	**-0.210**	**0.575**	**0.477**	**0.692**	**0.461**	1.000	**0.386**	-0.128	0.074	**-0.527**	-0.072
	0.277	*0.618*	*0.889*	*0.000*	*0.004*	*0.000*	*0.000*	*0.000*	*0.000*		*0.000*	*0.085*	*0.318*	*0.000*	*0.333*
Elevation above 1000m (%)	-0.041	-0.022	0.066	**0.176**	-0.097	**0.415**	**0.238**	**0.501**	0.100	**0.386**	1.000	0.127	-0.024	**-0.622**	-0.070
	0.583	*0.773*	*0.374*	*0.017*	*0.192*	*0.000*	*0.001*	*0.000*	*0.177*	*0.000*		*0.088*	*0.748*	*0.000*	*0.348*
Elevation above 400m (Uplands) (%)	0.134	0.022	0.074	0.035	-0.116	0.140	**-0.158**	0.055	-0.074	-0.128	0.127	1.000	-0.101	**-0.552**	-0.004
	0.071	*0.773*	*0.321*	*0.640*	*0.119*	*0.058*	*0.032*	*0.458*	*0.318*	*0.085*	*0.088*		*0.174*	*0.000*	*0.957*
Elevation High Plateau (%)	-0.040	-0.048	-0.015	**0.237**	-0.116	0.069	**0.369**	**0.252**	-0.067	0.074	-0.024	-0.101	1.000	**-0.408**	-0.041
	0.588	*0.521*	*0.842*	*0.001*	*0.117*	*0.355*	*0.000*	*0.001*	*0.365*	*0.318*	*0.748*	*0.174*		*0.000*	*0.583*
Elevation Low Plains (%)	0.006	0.038	-0.090	**-0.348**	**0.256**	**-0.573**	**-0.334**	**-0.678**	**-0.271**	**-0.527**	**-0.622**	**-0.552**	**-0.408**	1.000	0.022
	0.935	*0.606*	*0.228*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*		*0.772*
Elevation Depression (%)	-0.134	-0.010	0.008	**0.147**	-0.077	0.094	**-0.146**	**0.194**	-0.033	-0.072	-0.070	-0.004	-0.041	0.022	1.000
	0.070	*0.889*	*0.909*	*0.048*	*0.300*	*0.207*	*0.049*	*0.008*	*0.659*	*0.333*	*0.348*	*0.957*	*0.583*	*0.772*	

Table B2-2. Correlation Matrix of Items (b)

Correlations	Number of different climate zones (1-14)	Climate - Af (moist)	Climate - Am (Monsoon)	Climate - Aw (Dry Season)	Climate - Bs (Steppe)	Climate - Bw (Desert)	Climate - C (Temperate)	Climate - Cw (Winter Dry)	Climate - Cs (Summer Dry)	Climate - Cf (Moist)	Climate - D (Cold)	Climate - Df (Moist)	Climate - Dw (Winter Dry)	Climate - ET (Tundra)	Climate - EF (Arctic)
Forrested Land (%)	0.042	0.318	**0.301**	**0.242**	**-0.218**	**-0.385**	0.034	0.061	-0.035	-0.067	0.029	0.080	0.063	-0.106	-0.063
	0.573	*0.000*	*0.000*	*0.001*	*0.003*	*0.000*	*0.648*	*0.411*	*0.640*	*0.367*	*0.700*	*0.284*	*0.398*	*0.152*	*0.394*
Arable Land (%)	-0.003	-0.210	**-0.163**	-0.019	-0.067	**-0.221**	0.083	**0.170**	0.016	0.001	**0.293**	**0.171**	0.087	-0.030	-0.075
	0.973	*0.004*	*0.028*	*0.803*	*0.365*	*0.003*	*0.266*	*0.022*	*0.832*	*0.992*	*0.000*	*0.021*	*0.240*	*0.690*	*0.311*
Land Area (sqkm)	**0.543**	0.012	-0.038	0.038	**0.413**	**0.398**	**0.255**	0.139	0.056	**0.217**	**0.246**	**0.156**	**0.341**	**0.364**	**0.421**
	0.000	*0.869*	*0.605*	*0.613*	*0.000*	*0.000*	*0.001*	*0.060*	*0.453*	*0.003*	*0.001*	*0.035*	*0.000*	*0.000*	*0.000*
Landlocked (1/0)	0.036	**-0.153**	-0.110	**-0.168**	**0.166**	0.019	0.036	-0.063	0.061	-0.025	0.131	-0.050	0.108	0.111	0.136
	0.624	*0.039*	*0.138*	*0.023*	*0.025*	*0.798*	*0.630*	*0.395*	*0.412*	*0.742*	*0.076*	*0.506*	*0.146*	*0.134*	*0.066*
Island (1/0)	**-0.318**	-0.028	**0.265**	-0.088	**-0.301**	**-0.277**	-0.130	-0.113	-0.121	-0.100	**-0.237**	**-0.189**	**-0.186**	**-0.154**	**-0.151**
	0.000	*0.708*	*0.000*	*0.238*	*0.000*	*0.000*	*0.080*	*0.129*	*0.103*	*0.177*	*0.001*	*0.010*	*0.012*	*0.038*	*0.041*
Highest Elevation (m)	**0.685**	0.097	-0.058	0.126	**0.448**	**0.382**	**0.265**	**0.161**	**0.396**	**0.247**	**0.214**	**0.157**	**0.326**	**0.564**	**0.537**
	0.000	*0.190*	*0.438*	*0.089*	*0.000*	*0.000*	*0.000*	*0.030*	*0.000*	*0.001*	*0.004*	*0.034*	*0.000*	*0.000*	*0.000*
Lowest Elevation (m)	-0.082	-0.020	-0.057	-0.077	-0.096	**-0.153**	-0.062	-0.099	**0.146**	-0.093	0.000	0.007	**0.157**	-0.003	-0.062
	0.272	*0.787*	*0.442*	*0.301*	*0.197*	*0.039*	*0.403*	*0.185*	*0.049*	*0.209*	*0.995*	*0.920*	*0.034*	*0.973*	*0.408*
Average Elevation (m)	**0.346**	0.032	-0.115	-0.037	**0.328**	**0.201**	0.076	0.013	**0.309**	0.112	0.071	0.039	**0.243**	**0.351**	**0.303**
	0.000	*0.663*	*0.122*	*0.617*	*0.000*	*0.006*	*0.303*	*0.860*	*0.000*	*0.130*	*0.343*	*0.597*	*0.001*	*0.000*	*0.000*
Elevation above 4000m (%)	**0.340**	0.004	-0.111	0.024	**0.210**	**0.180**	0.116	0.041	**0.265**	0.056	0.081	**0.149**	**0.175**	**0.340**	**0.453**
	0.000	*0.955*	*0.135*	*0.745*	*0.004*	*0.015*	*0.117*	*0.584*	*0.000*	*0.453*	*0.276*	*0.044*	*0.018*	*0.000*	*0.000*
Elevation above 2000m (%)	**0.269**	-0.036	**-0.199**	-0.031	0.123	0.081	0.132	0.049	**0.207**	0.128	0.105	0.130	**0.280**	**0.379**	**0.286**
	0.000	*0.625*	*0.007*	*0.673*	*0.097*	*0.275*	*0.074*	*0.507*	*0.005*	*0.085*	*0.157*	*0.079*	*0.000*	*0.000*	*0.000*
Elevation above 1000m (%)	**0.188**	-0.034	-0.137	-0.024	0.094	0.071	0.065	0.040	**0.244**	0.095	0.063	0.000	**0.190**	**0.269**	**0.155**
	0.011	*0.649*	*0.064*	*0.750*	*0.206*	*0.337*	*0.385*	*0.589*	*0.001*	*0.203*	*0.395*	*0.998*	*0.010*	*0.000*	*0.036*
Elevation above 400m (Uplands) (%)	0.047	-0.043	0.050	0.075	0.071	0.056	-0.013	0.006	-0.075	0.097	-0.041	-0.007	0.073	0.008	-0.036
	0.524	*0.562*	*0.505*	*0.316*	*0.341*	*0.454*	*0.863*	*0.938*	*0.316*	*0.190*	*0.584*	*0.927*	*0.327*	*0.912*	*0.633*
Elevation High Plateau (%)	0.093	-0.002	-0.035	-0.074	**0.203**	0.110	0.053	0.056	**0.213**	0.012	-0.058	-0.030	0.006	-0.011	-0.053
	0.210	*0.978*	*0.634*	*0.319*	*0.006*	*0.139*	*0.473*	*0.450*	*0.004*	*0.874*	*0.435*	*0.687*	*0.940*	*0.883*	*0.479*
Elevation Low Plains (%)	**-0.290**	0.056	0.135	0.010	**-0.259**	**-0.176**	-0.104	-0.065	**-0.262**	**-0.156**	-0.024	-0.045	**-0.245**	**-0.289**	**-0.182**
	0.000	*0.451*	*0.068*	*0.891*	*0.000*	*0.017*	*0.161*	*0.386*	*0.000*	*0.035*	*0.750*	*0.546*	*0.001*	*0.000*	*0.014*
Elevation Depression (%)	-0.055	-0.056	-0.122	-0.060	**0.154**	0.119	-0.045	-0.083	-0.066	0.003	0.016	-0.073	-0.048	-0.059	-0.039
	0.462	*0.451*	*0.101*	*0.420*	*0.038*	*0.109*	*0.544*	*0.264*	*0.373*	*0.966*	*0.829*	*0.323*	*0.519*	*0.430*	*0.600*

Table B2-2. Correlation Matrix of Items (c)

Correlations	Number of different Hazards (0-15)	Hazard - Earthquakes	Hazard - Tsunamis	Hazard - Floods	Hazard - Mudslides	Hazard - Droughts	Hazard - Forest Fires	Hazard - Storms	Hazard - Hurricanes	Hazard - Typhoons	Hazard - Cyclones	Hazard - Tornados	Hazard - Blizzards	Hazard - Avalanches	Hazard - Dust Storms	Hazard - Volcanoes
Forrested Land (%)	0.054	0.045	0.114	**0.181**	0.021	-0.130	0.077	0.042	0.013	**0.162**	-0.041	-0.006	-0.073	0.060	**-0.323**	0.098
	0.465	0.545	0.124	0.014	0.774	0.080	0.297	0.573	0.861	0.029	0.584	0.938	0.328	0.421	0.000	0.188
Arable Land (%)	-0.085	0.023	-0.085	0.018	0.092	-0.042	-0.022	0.061	-0.045	-0.121	0.017	0.015	-0.046	0.069	**-0.197**	-0.110
	0.253	0.758	0.254	0.813	0.218	0.571	0.767	0.409	0.543	0.102	0.824	0.835	0.535	0.356	0.008	0.137
Land Area (sqkm)	**0.312**	**0.159**	**0.219**	**0.191**	0.053	0.096	**0.427**	-0.009	-0.017	0.007	0.091	**0.218**	0.035	-0.043	-0.007	0.117
	0.000	0.032	0.003	0.009	0.473	0.197	0.000	0.902	0.814	0.927	0.220	0.003	0.635	0.564	0.921	0.115
Landlocked (1/0)	-0.137	-0.117	-0.123	-0.031	0.077	0.123	-0.046	0.018	**-0.193**	**-0.145**	**-0.151**	-0.051	**0.152**	0.145	-0.017	-0.140
	0.064	0.115	0.097	0.680	0.303	0.097	0.533	0.810	0.009	0.050	0.042	0.492	0.039	0.051	0.822	0.058
Island (1/0)	-0.058	-0.058	0.026	**-0.341**	-0.082	**-0.171**	-0.064	-0.124	**0.313**	**0.169**	**0.291**	0.068	-0.040	-0.100	**-0.168**	**0.215**
	0.436	0.432	0.727	0.000	0.271	0.021	0.389	0.094	0.000	0.023	0.000	0.363	0.587	0.176	0.023	0.004
Highest Elevation (m)	**0.456**	**0.455**	**0.301**	**0.252**	**0.282**	**0.155**	**0.183**	0.101	-0.100	-0.052	-0.017	0.090	0.064	0.111	-0.096	**0.216**
	0.000	0.000	0.000	0.001	0.000	0.037	0.013	0.175	0.177	0.484	0.819	0.223	0.387	0.133	0.198	0.003
Lowest Elevation (m)	-0.091	**-0.194**	-0.082	-0.044	0.002	0.120	0.012	0.013	-0.093	-0.076	-0.079	-0.046	**0.207**	0.095	-0.015	-0.025
	0.221	0.009	0.268	0.551	0.974	0.107	0.868	0.859	0.209	0.308	0.290	0.534	0.005	0.202	0.844	0.733
Average Elevation (m)	0.144	**0.220**	0.121	0.055	0.101	0.138	0.039	0.030	-0.150	-0.112	-0.079	-0.003	0.125	0.106	-0.036	0.071
	0.052	0.003	0.102	0.458	0.172	0.062	0.600	0.685	0.043	0.132	0.290	0.969	0.091	0.153	0.625	0.343
Elevation above 4000m (%)	**0.187**	**0.178**	**0.174**	**0.181**	0.118	0.083	-0.053	**0.152**	-0.092	0.092	-0.072	-0.024	-0.017	-0.043	-0.021	0.017
	0.011	0.016	0.018	0.014	0.111	0.266	0.477	0.040	0.213	0.216	0.333	0.743	0.817	0.565	0.774	0.823
Elevation above 2000m (%)	**0.221**	**0.254**	**0.212**	0.102	**0.163**	0.130	0.038	-0.006	-0.078	-0.048	-0.124	-0.008	0.092	**0.174**	-0.093	0.135
	0.003	0.001	0.004	0.170	0.027	0.078	0.607	0.938	0.294	0.517	0.094	0.917	0.218	0.019	0.212	0.069
Elevation above 1000m (%)	0.093	**0.221**	0.087	-0.141	0.053	0.049	0.098	-0.068	-0.127	0.012	0.039	0.033	**0.267**	**0.191**	-0.009	0.018
	0.210	0.003	0.244	0.056	0.476	0.513	0.187	0.360	0.087	0.868	0.598	0.662	0.000	0.009	0.902	0.805
Elevation above 400m (Uplands) (%)	0.069	0.144	-0.056	0.108	0.003	-0.063	0.009	-0.055	-0.035	-0.028	-0.049	-0.040	-0.010	0.053	0.141	0.039
	0.355	0.052	0.455	0.144	0.968	0.398	0.907	0.464	0.636	0.702	0.506	0.593	0.898	0.475	0.057	0.599
Elevation High Plateau (%)	-0.094	-0.142	-0.029	-0.076	-0.053	**0.187**	-0.066	0.065	-0.084	-0.087	-0.065	-0.030	-0.021	0.006	-0.014	-0.042
	0.208	0.056	0.700	0.306	0.478	0.011	0.375	0.383	0.256	0.244	0.384	0.682	0.773	0.934	0.852	0.569
Elevation Low Plains (%)	-0.142	**-0.231**	-0.086	-0.031	-0.080	-0.132	-0.018	0.012	**0.157**	0.058	0.100	0.032	-0.123	**-0.166**	-0.046	-0.057
	0.055	0.002	0.247	0.676	0.281	0.076	0.804	0.872	0.034	0.437	0.179	0.668	0.098	0.025	0.534	0.446
Elevation Depression (%)	0.030	0.088	-0.036	-0.043	0.121	0.088	-0.032	-0.032	-0.056	-0.042	-0.044	-0.015	-0.010	-0.026	0.117	-0.062
	0.683	0.237	0.632	0.565	0.102	0.237	0.666	0.666	0.451	0.571	0.557	0.842	0.888	0.727	0.116	0.401

Table B2-2. Correlation Matrix of Items (d)

Correlations	*Forrested Land (%)*	*Arable Land (%)*	*Land Area (sqkm)*	*Landlocked (1/0)*	*Island (1/0)*	*Highest Elevation (m)*	*Lowest Elevation (m)*	*Average Elevation (m)*	*Elevation above 4000m (%)*	*Elevation above 2000m (%)*	*Elevation above 1000m (%)*	*Elevation above 400m (Uplands) (%)*	*Elevation High Plateau (%)*	*Elevation Low Plains (%)*	*Elevation Depression (%)*
Number of different climate zones (1-14)	0.042	-0.003	**0.543**	0.036	**-0.318**	**0.685**	-0.082	**0.346**	**0.340**	**0.269**	**0.188**	0.047	0.093	**-0.290**	-0.055
	0.573	*0.973*	*0.000*	*0.624*	*0.000*	*0.000*	*0.272*	*0.000*	*0.000*	*0.000*	*0.011*	*0.524*	*0.210*	*0.000*	*0.462*
Climate - Af (moist)	**0.318**	**-0.210**	0.012	**-0.153**	-0.028	0.097	-0.020	0.032	0.004	-0.036	-0.034	-0.043	-0.002	0.056	-0.056
	0.000	*0.004*	*0.869*	*0.039*	*0.708*	*0.190*	*0.787*	*0.663*	*0.955*	*0.625*	*0.649*	*0.562*	*0.978*	*0.451*	*0.451*
Climate - Am (Monsoon)	**0.301**	**-0.163**	-0.038	-0.110	**0.265**	-0.058	-0.057	-0.115	-0.111	**-0.199**	-0.137	0.050	-0.035	0.135	-0.122
	0.000	*0.028*	*0.605*	*0.138*	*0.000*	*0.438*	*0.442*	*0.122*	*0.135*	*0.007*	*0.064*	*0.505*	*0.634*	*0.068*	*0.101*
Climate - Aw (Dry Season)	**0.242**	-0.019	0.038	**-0.168**	-0.088	0.126	-0.077	-0.037	0.024	-0.031	-0.024	0.075	-0.074	0.010	-0.060
	0.001	*0.803*	*0.613*	*0.023*	*0.238*	*0.089*	*0.301*	*0.617*	*0.745*	*0.673*	*0.750*	*0.316*	*0.319*	*0.891*	*0.420*
Climate - Bs (Steppe)	**-0.218**	-0.067	**0.413**	**0.166**	**-0.301**	**0.448**	-0.096	**0.328**	**0.210**	0.123	0.094	0.071	**0.203**	**-0.259**	**0.154**
	0.003	*0.365*	*0.000*	*0.025*	*0.000*	*0.000*	*0.197*	*0.000*	*0.004*	*0.097*	*0.206*	*0.341*	*0.006*	*0.000*	*0.038*
Climate - Bw (Desert)	**-0.385**	**-0.221**	**0.398**	0.019	**-0.277**	**0.382**	**-0.153**	**0.201**	**0.180**	0.081	0.071	0.056	0.110	**-0.176**	0.119
	0.000	*0.003*	*0.000*	*0.798*	*0.000*	*0.000*	*0.039*	*0.006*	*0.015*	*0.275*	*0.337*	*0.454*	*0.139*	*0.017*	*0.109*
Climate - C (Temperate)	0.034	0.083	**0.255**	0.036	-0.130	**0.265**	-0.062	0.076	0.116	0.132	0.065	-0.013	0.053	-0.104	-0.045
	0.648	*0.266*	*0.001*	*0.630*	*0.080*	*0.000*	*0.403*	*0.303*	*0.117*	*0.074*	*0.385*	*0.863*	*0.473*	*0.161*	*0.544*
Climate - Cw (Winter Dry)	0.061	**0.170**	0.139	-0.063	-0.113	**0.161**	-0.099	0.013	0.041	0.049	0.040	0.006	0.056	-0.065	-0.083
	0.411	*0.022*	*0.060*	*0.395*	*0.129*	*0.030*	*0.185*	*0.860*	*0.584*	*0.507*	*0.589*	*0.938*	*0.450*	*0.386*	*0.264*
Climate - Cs (Summer Dry)	-0.035	0.016	0.056	0.061	-0.121	**0.396**	**0.146**	**0.309**	**0.265**	**0.207**	**0.244**	-0.075	**0.213**	**-0.262**	-0.066
	0.640	*0.832*	*0.453*	*0.412*	*0.103*	*0.000*	*0.049*	*0.000*	*0.000*	*0.005*	*0.001*	*0.316*	*0.004*	*0.000*	*0.373*
Climate - Cf (Moist)	-0.067	0.001	**0.217**	-0.025	-0.100	**0.247**	-0.093	0.112	0.056	0.128	0.095	0.097	0.012	**-0.156**	0.003
	0.367	*0.992*	*0.003*	*0.742*	*0.177*	*0.001*	*0.209*	*0.130*	*0.453*	*0.085*	*0.203*	*0.190*	*0.874*	*0.035*	*0.966*
Climate - D (Cold)	0.029	**0.293**	**0.246**	0.131	**-0.237**	**0.214**	0.000	0.071	0.081	0.105	0.063	-0.041	-0.058	-0.024	0.016
	0.700	*0.000*	*0.001*	*0.076*	*0.001*	*0.004*	*0.995*	*0.343*	*0.276*	*0.157*	*0.395*	*0.584*	*0.435*	*0.750*	*0.829*
Climate - Df (Moist)	0.080	**0.171**	**0.156**	-0.050	**-0.189**	**0.157**	0.007	0.039	**0.149**	0.130	0.000	-0.007	-0.030	-0.045	-0.073
	0.284	*0.021*	*0.035*	*0.506*	*0.010*	*0.034*	*0.920*	*0.597*	*0.044*	*0.079*	*0.998*	*0.927*	*0.687*	*0.546*	*0.323*
Climate - Dw (Winter Dry)	0.063	0.087	**0.341**	0.108	**-0.186**	**0.326**	**0.157**	**0.243**	**0.175**	**0.280**	**0.190**	0.073	0.006	**-0.245**	-0.048
	0.398	*0.240*	*0.000*	*0.146*	*0.012*	*0.000*	*0.034*	*0.001*	*0.018*	*0.000*	*0.010*	*0.327*	*0.940*	*0.001*	*0.519*
Climate - ET (Tundra)	-0.106	-0.030	**0.364**	0.111	**-0.154**	**0.564**	-0.003	**0.351**	**0.340**	**0.379**	**0.269**	0.008	-0.011	**-0.289**	-0.059
	0.152	*0.690*	*0.000*	*0.134*	*0.038*	*0.000*	*0.973*	*0.000*	*0.000*	*0.000*	*0.000*	*0.912*	*0.883*	*0.000*	*0.430*
Climate - EF (Arctic)	-0.063	-0.075	**0.421**	0.136	**-0.151**	**0.537**	-0.062	**0.303**	**0.453**	**0.286**	**0.155**	-0.036	-0.053	**-0.182**	-0.039
	0.394	*0.311*	*0.000*	*0.066*	*0.041*	*0.000*	*0.408*	*0.000*	*0.000*	*0.000*	*0.036*	*0.633*	*0.479*	*0.014*	*0.600*

Table B2-2. Correlation Matrix of Items (e)

Correlations	*Number of different climate zones (1-14)*	*Climate - Af (moist)*	*Climate - Am (Monsoon)*	*Climate - Aw (Dry Season)*	*Climate - Bs (Steppe)*	*Climate - Bw (Desert)*	*Climate - C (Temperate)*	*Climate - Cw (Winter Dry)*	*Climate - Cs (Summer Dry)*	*Climate - Cf (Moist)*	*Climate - D (Cold)*	*Climate - Df (Moist)*	*Climate - Dw (Winter Dry)*	*Climate - ET (Tundra)*	*Climate - EF (Arctic)*
Number of different climate zones (1-14)	1.000	**0.205** *0.005*	0.043 *0.561*	**0.279** *0.000*	**0.671** *0.000*	**0.496** *0.000*	**0.527** *0.000*	**0.432** *0.000*	**0.297** *0.000*	**0.487** *0.000*	**0.352** *0.000*	**0.275** *0.000*	**0.271** *0.000*	**0.621** *0.000*	**0.505** *0.000*
Climate - Af (moist)	**0.205** *0.005*	1.000	**0.268** *0.000*	**0.406** *0.000*	-0.053 *0.480*	**-0.149** *0.044*	-0.072 *0.330*	0.094 *0.206*	0.020 *0.784*	0.090 *0.227*	-0.129 *0.082*	0.026 *0.726*	-0.135 *0.068*	-0.121 *0.104*	-0.048 *0.518*
Climate - Am (Monsoon)	0.043 *0.561*	**0.268** *0.000*	1.000	**0.340** *0.000*	-0.011 *0.886*	**-0.226** *0.002*	-0.124 *0.096*	**-0.178** *0.016*	-0.002 *0.980*	0.002 *0.975*	**-0.313** *0.000*	**-0.179** *0.015*	**-0.293** *0.000*	**-0.234** *0.001*	-0.066 *0.373*
Climate - Aw (Dry Season)	**0.279** *0.000*	**0.406** *0.000*	**0.340** *0.000*	1.000	0.052 *0.481*	-0.097 *0.191*	-0.084 *0.260*	-0.007 *0.929*	0.117 *0.116*	0.141 *0.058*	-0.101 *0.172*	-0.073 *0.327*	-0.145 *0.051*	-0.091 *0.219*	0.001 *0.993*
Climate - Bs (Steppe)	**0.671** *0.000*	-0.053 *0.480*	-0.011 *0.886*	0.052 *0.481*	1.000	**0.635** *0.000*	**0.324** *0.000*	0.133 *0.073*	**0.189** *0.011*	**0.287** *0.000*	**0.205** *0.005*	0.008 *0.913*	0.050 *0.498*	**0.332** *0.000*	**0.283** *0.000*
Climate - Bw (Desert)	**0.496** *0.000*	**-0.149** *0.044*	**-0.226** *0.002*	-0.097 *0.191*	**0.635** *0.000*	1.000	**0.260** *0.000*	-0.009 *0.906*	0.102 *0.170*	**0.279** *0.000*	0.106 *0.153*	-0.105 *0.155*	0.102 *0.170*	**0.343** *0.000*	**0.342** *0.000*
Climate - C (Temperate)	**0.527** *0.000*	-0.072 *0.330*	-0.124 *0.096*	-0.084 *0.260*	**0.324** *0.000*	**0.260** *0.000*	1.000	**0.458** *0.000*	0.095 *0.202*	**0.227** *0.002*	**0.170** *0.021*	**0.155** *0.036*	0.076 *0.305*	**0.292** *0.000*	**0.205** *0.005*
Climate - Cw (Winter Dry)	**0.432** *0.000*	0.094 *0.206*	**-0.178** *0.016*	-0.007 *0.929*	0.133 *0.073*	-0.009 *0.906*	**0.458** *0.000*	1.000	0.050 *0.505*	0.128 *0.085*	0.087 *0.239*	**0.152** *0.040*	0.087 *0.242*	**0.214** *0.004*	0.081 *0.276*
Climate - Cs (Summer Dry)	**0.297** *0.000*	0.020 *0.784*	-0.002 *0.980*	0.117 *0.116*	**0.189** *0.011*	0.102 *0.170*	0.095 *0.202*	0.050 *0.505*	1.000	-0.047 *0.524*	-0.087 *0.243*	-0.036 *0.630*	0.027 *0.719*	0.085 *0.250*	**0.147** *0.047*
Climate - Cf (Moist)	**0.487** *0.000*	0.090 *0.227*	0.002 *0.975*	0.141 *0.058*	**0.287** *0.000*	**0.279** *0.000*	**0.227** *0.002*	0.128 *0.085*	-0.047 *0.524*	1.000	-0.021 *0.780*	0.086 *0.246*	0.062 *0.403*	**0.189** *0.010*	**0.190** *0.010*
Climate - D (Cold)	**0.352** *0.000*	-0.129 *0.082*	**-0.313** *0.000*	-0.101 *0.172*	**0.205** *0.005*	0.106 *0.153*	**0.170** *0.021*	0.087 *0.239*	-0.087 *0.243*	-0.021 *0.780*	1.000	**0.395** *0.000*	**0.196** *0.008*	**0.368** *0.000*	**0.171** *0.020*
Climate - Df (Moist)	**0.275** *0.000*	0.026 *0.726*	**-0.179** *0.015*	-0.073 *0.327*	0.008 *0.913*	-0.105 *0.155*	**0.155** *0.036*	**0.152** *0.040*	-0.036 *0.630*	0.086 *0.246*	**0.395** *0.000*	1.000	**0.173** *0.019*	**0.310** *0.000*	0.064 *0.390*
Climate - Dw (Winter Dry)	**0.271** *0.000*	-0.135 *0.068*	**-0.293** *0.000*	-0.145 *0.051*	0.050 *0.498*	0.102 *0.170*	0.076 *0.305*	0.087 *0.242*	0.027 *0.719*	0.062 *0.403*	**0.196** *0.008*	**0.173** *0.019*	1.000	**0.364** *0.000*	0.115 *0.121*
Climate - ET (Tundra)	**0.621** *0.000*	-0.121 *0.104*	**-0.234** *0.001*	-0.091 *0.219*	**0.332** *0.000*	**0.343** *0.000*	**0.292** *0.000*	**0.214** *0.004*	0.085 *0.250*	**0.189** *0.010*	**0.368** *0.000*	**0.310** *0.000*	**0.364** *0.000*	1.000	**0.605** *0.000*
Climate - EF (Arctic)	**0.505** *0.000*	-0.048 *0.518*	-0.066 *0.373*	0.001 *0.993*	**0.283** *0.000*	**0.342** *0.000*	**0.205** *0.005*	0.081 *0.276*	**0.147** *0.047*	**0.190** *0.010*	**0.171** *0.020*	0.064 *0.390*	0.115 *0.121*	**0.605** *0.000*	1.000

Table B2-2. Correlation Matrix of Items (f)

Correlations	*Number of different Hazards (0-15)*	*Hazard - Earthquakes*	*Hazard - Tsunamis*	*Hazard - Floods*	*Hazard - Mudslides*	*Hazard - Droughts*	*Hazard - Forest Fires*	*Hazard - Storms*	*Hazard - Hurricanes*	*Hazard - Typhoons*	*Hazard - Cyclones*	*Hazard - Tornados*	*Hazard - Blizzards*	*Hazard - Avalanches*	*Hazard - Dust Storms*	*Hazard - Volcanoes*
Number of different climate zones (1-14)	**0.383**	**0.309**	**0.299**	**0.293**	**0.190**	**0.147**	**0.195**	-0.004	-0.061	-0.047	0.015	**0.176**	0.088	0.037	-0.094	**0.147**
	0.000	*0.000*	*0.000*	*0.000*	*0.010*	*0.047*	*0.008*	*0.959*	*0.415*	*0.523*	*0.842*	*0.017*	*0.237*	*0.618*	*0.207*	*0.047*
Climate - Af (moist)	0.130	0.007	0.100	0.114	**0.147**	-0.027	0.130	0.130	-0.019	0.055	0.046	0.111	-0.029	-0.073	**-0.151**	0.125
	0.080	*0.922*	*0.177*	*0.126*	*0.048*	*0.716*	*0.079*	*0.079*	*0.796*	*0.458*	*0.538*	*0.134*	*0.692*	*0.324*	*0.042*	*0.093*
Climate - Am (Monsoon)	**0.158**	-0.126	0.061	0.096	-0.013	0.112	-0.043	0.008	**0.333**	-0.056	**0.242**	0.016	-0.064	**-0.159**	-0.093	**0.215**
	0.033	*0.088*	*0.412*	*0.194*	*0.863*	*0.130*	*0.566*	*0.910*	*0.000*	*0.450*	*0.001*	*0.833*	*0.390*	*0.032*	*0.208*	*0.003*
Climate - Aw (Dry Season)	**0.244**	0.107	**0.148**	0.139	**0.170**	0.075	-0.026	0.044	0.096	0.039	0.137	0.101	-0.032	-0.078	**-0.161**	**0.222**
	0.001	*0.148*	*0.046*	*0.060*	*0.022*	*0.315*	*0.722*	*0.557*	*0.196*	*0.600*	*0.064*	*0.172*	*0.672*	*0.292*	*0.029*	*0.003*
Climate - Bs (Steppe)	**0.174**	0.125	0.035	**0.152**	0.051	**0.331**	0.071	-0.039	-0.122	**-0.152**	0.050	0.046	0.113	-0.121	**0.147**	-0.097
	0.018	*0.091*	*0.640*	*0.040*	*0.494*	*0.000*	*0.337*	*0.602*	*0.100*	*0.039*	*0.499*	*0.539*	*0.127*	*0.104*	*0.047*	*0.191*
Climate - Bw (Desert)	**0.212**	**0.146**	0.127	0.077	0.028	**0.229**	0.109	-0.069	-0.112	-0.122	-0.038	0.064	0.132	-0.104	**0.481**	-0.076
	0.004	*0.048*	*0.087*	*0.302*	*0.707*	*0.002*	*0.143*	*0.355*	*0.131*	*0.101*	*0.606*	*0.391*	*0.075*	*0.163*	*0.000*	*0.304*
Climate - C (Temperate)	**0.168**	0.110	**0.236**	**0.164**	0.113	0.029	0.101	-0.073	-0.018	0.042	-0.032	**0.147**	-0.024	0.047	-0.065	0.011
	0.023	*0.138*	*0.001*	*0.026*	*0.127*	*0.700*	*0.172*	*0.328*	*0.812*	*0.576*	*0.663*	*0.046*	*0.750*	*0.529*	*0.385*	*0.884*
Climate - Cw (Winter Dry)	0.106	0.091	0.062	**0.232**	0.129	-0.044	0.098	0.040	-0.052	0.007	-0.093	0.059	-0.044	**0.173**	**-0.223**	0.044
	0.155	*0.222*	*0.406*	*0.002*	*0.082*	*0.552*	*0.188*	*0.592*	*0.487*	*0.928*	*0.209*	*0.431*	*0.558*	*0.019*	*0.002*	*0.556*
Climate - Cs (Summer Dry)	0.115	**0.145**	0.121	0.109	0.045	**0.206**	-0.041	0.091	-0.062	0.015	0.006	-0.049	-0.035	-0.086	-0.135	-0.054
	0.122	*0.050*	*0.104*	*0.142*	*0.544*	*0.005*	*0.582*	*0.223*	*0.401*	*0.837*	*0.938*	*0.507*	*0.640*	*0.245*	*0.069*	*0.467*
Climate - Cf (Moist)	**0.240**	**0.273**	**0.286**	0.057	0.034	0.093	**0.146**	-0.111	-0.032	0.057	-0.003	0.083	-0.036	-0.012	-0.017	**0.160**
	0.001	*0.000*	*0.000*	*0.443*	*0.649*	*0.211*	*0.048*	*0.136*	*0.671*	*0.441*	*0.968*	*0.267*	*0.628*	*0.877*	*0.822*	*0.031*
Climate - D (Cold)	-0.050	0.128	0.016	-0.031	0.070	-0.130	0.109	-0.029	-0.129	-0.021	-0.081	0.098	**0.171**	0.004	-0.074	-0.071
	0.499	*0.084*	*0.828*	*0.677*	*0.349*	*0.079*	*0.142*	*0.692*	*0.082*	*0.782*	*0.274*	*0.186*	*0.021*	*0.956*	*0.318*	*0.340*
Climate - Df (Moist)	0.030	**0.169**	0.037	0.072	0.013	**-0.148**	0.067	0.005	-0.013	-0.010	**-0.161**	0.074	-0.039	0.129	-0.117	0.094
	0.684	*0.022*	*0.621*	*0.331*	*0.864*	*0.045*	*0.369*	*0.946*	*0.864*	*0.898*	*0.029*	*0.322*	*0.604*	*0.082*	*0.115*	*0.206*
Climate - Dw (Winter Dry)	**0.213**	**0.235**	0.140	0.093	0.095	-0.036	**0.254**	0.005	-0.083	0.029	-0.042	0.137	**0.218**	**0.340**	-0.075	0.043
	0.004	*0.001*	*0.059*	*0.212*	*0.203*	*0.633*	*0.001*	*0.942*	*0.263*	*0.698*	*0.573*	*0.065*	*0.003*	*0.000*	*0.313*	*0.565*
Climate - ET (Tundra)	**0.192**	**0.253**	**0.154**	**0.153**	0.083	-0.080	0.119	-0.023	-0.076	-0.068	-0.074	0.104	**0.178**	**0.270**	-0.065	**0.149**
	0.009	*0.001*	*0.037*	*0.039*	*0.263*	*0.281*	*0.108*	*0.754*	*0.308*	*0.359*	*0.318*	*0.159*	*0.016*	*0.000*	*0.384*	*0.044*
Climate - EF (Arctic)	0.125	0.136	**0.199**	0.113	0.029	-0.002	0.035	0.134	-0.048	-0.005	-0.010	-0.029	-0.020	-0.051	-0.105	0.107
	0.093	*0.067*	*0.007*	*0.128*	*0.701*	*0.976*	*0.634*	*0.071*	*0.518*	*0.946*	*0.890*	*0.696*	*0.783*	*0.494*	*0.158*	*0.148*

Table B2-2. Correlation Matrix of Items (g)

Correlations	*Forrested Land (%)*	*Arable Land (%)*	*Land Area (sqkm)*	*Landlocked (1/0)*	*Island (1/0)*	*Highest Elevation (m)*	*Lowest Elevation (m)*	*Average Elevation (m)*	*Elevation above 4000m (%)*	*Elevation above 2000m (%)*	*Elevation above 1000m (%)*	*Elevation above 400m (Uplands) (%)*	*Elevation High Plateau (%)*	*Elevation Low Plains (%)*	*Elevation Depression (%)*
Number of different Hazards (0-15)	0.054	-0.085	**0.312**	-0.137	-0.058	**0.456**	-0.091	0.144	**0.187**	**0.221**	0.093	0.069	-0.094	-0.142	0.030
	0.465	*0.253*	*0.000*	*0.064*	*0.436*	*0.000*	*0.221*	*0.052*	*0.011*	*0.003*	*0.210*	*0.355*	*0.208*	*0.055*	*0.683*
Hazard - Earthquakes	0.045	0.023	**0.159**	-0.117	-0.058	**0.455**	**-0.194**	**0.220**	**0.178**	**0.254**	**0.221**	0.144	-0.142	**-0.231**	0.088
	0.545	*0.758*	*0.032*	*0.115*	*0.432*	*0.000*	*0.009*	*0.003*	*0.016*	*0.001*	*0.003*	*0.052*	*0.056*	*0.002*	*0.237*
Hazard - Tsunamis	0.114	-0.085	**0.219**	-0.123	0.026	**0.301**	-0.082	0.121	**0.174**	**0.212**	0.087	-0.056	-0.029	-0.086	-0.036
	0.124	*0.254*	*0.003*	*0.097*	*0.727*	*0.000*	*0.268*	*0.102*	*0.018*	*0.004*	*0.244*	*0.455*	*0.700*	*0.247*	*0.632*
Hazard - Floods	**0.181**	0.018	**0.191**	-0.031	**-0.341**	**0.252**	-0.044	0.055	**0.181**	0.102	-0.141	0.108	-0.076	-0.031	-0.043
	0.014	*0.813*	*0.009*	*0.680*	*0.000*	*0.001*	*0.551*	*0.458*	*0.014*	*0.170*	*0.056*	*0.144*	*0.306*	*0.676*	*0.565*
Hazard - Mudslides	0.021	0.092	0.053	0.077	-0.082	**0.282**	0.002	0.101	0.118	**0.163**	0.053	0.003	-0.053	-0.080	0.121
	0.774	*0.218*	*0.473*	*0.303*	*0.271*	*0.000*	*0.974*	*0.172*	*0.111*	*0.027*	*0.476*	*0.968*	*0.478*	*0.281*	*0.102*
Hazard - Droughts	-0.130	-0.042	0.096	0.123	**-0.171**	**0.155**	0.120	0.138	0.083	0.130	0.049	-0.063	**0.187**	-0.132	0.088
	0.080	*0.571*	*0.197*	*0.097*	*0.021*	*0.037*	*0.107*	*0.062*	*0.266*	*0.078*	*0.513*	*0.398*	*0.011*	*0.076*	*0.237*
Hazard - Forest Fires	0.077	-0.022	**0.427**	-0.046	-0.064	**0.183**	0.012	0.039	-0.053	0.038	0.098	0.009	-0.066	-0.018	-0.032
	0.297	*0.767*	*0.000*	*0.533*	*0.389*	*0.013*	*0.868*	*0.600*	*0.477*	*0.607*	*0.187*	*0.907*	*0.375*	*0.804*	*0.666*
Hazard - Storms	0.042	0.061	-0.009	0.018	-0.124	0.101	0.013	0.030	**0.152**	-0.006	-0.068	-0.055	0.065	0.012	-0.032
	0.573	*0.409*	*0.902*	*0.810*	*0.094*	*0.175*	*0.859*	*0.685*	*0.040*	*0.938*	*0.360*	*0.464*	*0.383*	*0.872*	*0.666*
Hazard - Hurricanes	0.013	-0.045	-0.017	**-0.193**	**0.313**	-0.100	-0.093	**-0.150**	-0.092	-0.078	-0.127	-0.035	-0.084	**0.157**	-0.056
	0.861	*0.543*	*0.814*	*0.009*	*0.000*	*0.177*	*0.209*	*0.043*	*0.213*	*0.294*	*0.087*	*0.636*	*0.256*	*0.034*	*0.451*
Hazard - Typhoons	**0.162**	-0.121	0.007	**-0.145**	**0.169**	-0.052	-0.076	-0.112	0.092	-0.048	0.012	-0.028	-0.087	0.058	-0.042
	0.029	*0.102*	*0.927*	*0.050*	*0.023*	*0.484*	*0.308*	*0.132*	*0.216*	*0.517*	*0.868*	*0.702*	*0.244*	*0.437*	*0.571*
Hazard - Cyclones	-0.041	0.017	0.091	**-0.151**	**0.291**	-0.017	-0.079	-0.079	-0.072	-0.124	0.039	-0.049	-0.065	0.100	-0.044
	0.584	*0.824*	*0.220*	*0.042*	*0.000*	*0.819*	*0.290*	*0.290*	*0.333*	*0.094*	*0.598*	*0.506*	*0.384*	*0.179*	*0.557*
Hazard - Tornados	-0.006	0.015	**0.218**	-0.051	0.068	0.090	-0.046	-0.003	-0.024	-0.008	0.033	-0.040	-0.030	0.032	-0.015
	0.938	*0.835*	*0.003*	*0.492*	*0.363*	*0.223*	*0.534*	*0.969*	*0.743*	*0.917*	*0.662*	*0.593*	*0.682*	*0.668*	*0.842*
Hazard - Blizzards	-0.073	-0.046	0.035	**0.152**	-0.040	0.064	**0.207**	0.125	-0.017	0.092	**0.267**	-0.010	-0.021	-0.123	-0.010
	0.328	*0.535*	*0.635*	*0.039*	*0.587*	*0.387*	*0.005*	*0.091*	*0.817*	*0.218*	*0.000*	*0.898*	*0.773*	*0.098*	*0.888*
Hazard - Avalanches	0.060	0.069	-0.043	0.145	-0.100	0.111	0.095	0.106	-0.043	**0.174**	**0.191**	0.053	0.006	**-0.166**	-0.026
	0.421	*0.356*	*0.564*	*0.051*	*0.176*	*0.133*	*0.202*	*0.153*	*0.565*	*0.019*	*0.009*	*0.475*	*0.934*	*0.025*	*0.727*
Hazard - Dust Storms	**-0.323**	**-0.197**	-0.007	-0.017	**-0.168**	-0.096	-0.015	-0.036	-0.021	-0.093	-0.009	0.141	-0.014	-0.046	0.117
	0.000	*0.008*	*0.921*	*0.822*	*0.023*	*0.198*	*0.844*	*0.625*	*0.774*	*0.212*	*0.902*	*0.057*	*0.852*	*0.534*	*0.116*
Hazard - Volcanoes	0.098	-0.110	0.117	-0.140	**0.215**	**0.216**	-0.025	0.071	0.017	0.135	0.018	0.039	-0.042	-0.057	-0.062
	0.188	*0.137*	*0.115*	*0.058*	*0.004*	*0.003*	*0.733*	*0.343*	*0.823*	*0.069*	*0.805*	*0.599*	*0.569*	*0.446*	*0.401*

Correlation at sig.-level .05
Sig. Level (2-sided)

Table B2-2. Correlation Matrix of Items (h)

Correlations	*Number of different climate zones (1-14)*	*Climate - Af (moist)*	*Climate - Am (Monsoon)*	*Climate - Aw (Dry Season)*	*Climate - Bs (Steppe)*	*Climate - Bw (Desert)*	*Climate - C (Temperate)*	*Climate - Cw (Winter Dry)*	*Climate - Cs (Summer Dry)*	*Climate - Cf (Moist)*	*Climate - D (Cold)*	*Climate - Df (Moist)*	*Climate - Dw (Winter Dry)*	*Climate - ET (Tundra)*	*Climate - EF (Arctic)*
Number of different Hazards (0-15)	**0.383**	0.130	**0.158**	**0.244**	**0.174**	**0.212**	**0.168**	0.106	0.115	**0.240**	-0.050	0.030	**0.213**	**0.192**	0.125
	0.000	*0.080*	*0.033*	*0.001*	*0.018*	*0.004*	*0.023*	*0.155*	*0.122*	*0.001*	*0.499*	*0.684*	*0.004*	*0.009*	*0.093*
Hazard - Earthquakes	**0.309**	0.007	-0.126	0.107	0.125	**0.146**	0.110	0.091	**0.145**	**0.273**	0.128	**0.169**	**0.235**	**0.253**	0.136
	0.000	*0.922*	*0.088*	*0.148*	*0.091*	*0.048*	*0.138*	*0.222*	*0.050*	*0.000*	*0.084*	*0.022*	*0.001*	*0.001*	*0.067*
Hazard - Tsunamis	**0.299**	0.100	0.061	**0.148**	0.035	0.127	**0.236**	0.062	0.121	**0.286**	0.016	0.037	**0.140**	**0.154**	**0.199**
	0.000	*0.177*	*0.412*	*0.046*	*0.640*	*0.087*	*0.001*	*0.406*	*0.104*	*0.000*	*0.828*	*0.621*	*0.059*	*0.037*	*0.007*
Hazard - Floods	**0.293**	0.114	0.096	0.139	**0.152**	0.077	**0.164**	**0.232**	0.109	0.057	-0.031	0.072	0.093	**0.153**	0.113
	0.000	*0.126*	*0.194*	*0.060*	*0.040*	*0.302*	*0.026*	*0.002*	*0.142*	*0.443*	*0.677*	*0.331*	*0.212*	*0.039*	*0.128*
Hazard - Mudslides	**0.190**	**0.147**	-0.013	**0.170**	0.051	0.028	0.113	0.129	0.045	0.034	0.070	0.013	0.095	0.083	0.029
	0.010	*0.048*	*0.863*	*0.022*	*0.494*	*0.707*	*0.127*	*0.082*	*0.544*	*0.649*	*0.349*	*0.864*	*0.203*	*0.263*	*0.701*
Hazard - Droughts	**0.147**	-0.027	0.112	0.075	**0.331**	**0.229**	0.029	-0.044	**0.206**	0.093	-0.130	**-0.148**	-0.036	-0.080	-0.002
	0.047	*0.716*	*0.130*	*0.315*	*0.000*	*0.002*	*0.700*	*0.552*	*0.005*	*0.211*	*0.079*	*0.045*	*0.633*	*0.281*	*0.976*
Hazard - Forest Fires	**0.195**	0.130	-0.043	-0.026	0.071	0.109	0.101	0.098	-0.041	**0.146**	0.109	0.067	**0.254**	0.119	0.035
	0.008	*0.079*	*0.566*	*0.722*	*0.337*	*0.143*	*0.172*	*0.188*	*0.582*	*0.048*	*0.142*	*0.369*	*0.001*	*0.108*	*0.634*
Hazard - Storms	-0.004	0.130	0.008	0.044	-0.039	-0.069	-0.073	0.040	0.091	-0.111	-0.029	0.005	0.005	-0.023	0.134
	0.959	*0.079*	*0.910*	*0.557*	*0.602*	*0.355*	*0.328*	*0.592*	*0.223*	*0.136*	*0.692*	*0.946*	*0.942*	*0.754*	*0.071*
Hazard - Hurricanes	-0.061	-0.019	**0.333**	0.096	-0.122	-0.112	-0.018	-0.052	-0.062	-0.032	-0.129	-0.013	-0.083	-0.076	-0.048
	0.415	*0.796*	*0.000*	*0.196*	*0.100*	*0.131*	*0.812*	*0.487*	*0.401*	*0.671*	*0.082*	*0.864*	*0.263*	*0.308*	*0.518*
Hazard - Typhoons	-0.047	0.055	-0.056	0.039	**-0.152**	-0.122	0.042	0.007	0.015	0.057	-0.021	-0.010	0.029	-0.068	-0.005
	0.523	*0.458*	*0.450*	*0.600*	*0.039*	*0.101*	*0.576*	*0.928*	*0.837*	*0.441*	*0.782*	*0.898*	*0.698*	*0.359*	*0.946*
Hazard - Cyclones	0.015	0.046	**0.242**	0.137	0.050	-0.038	-0.032	-0.093	0.006	-0.003	-0.081	**-0.161**	-0.042	-0.074	-0.010
	0.842	*0.538*	*0.001*	*0.064*	*0.499*	*0.606*	*0.663*	*0.209*	*0.938*	*0.968*	*0.274*	*0.029*	*0.573*	*0.318*	*0.890*
Hazard - Tornados	**0.176**	0.111	0.016	0.101	0.046	0.064	**0.147**	0.059	-0.049	0.083	0.098	0.074	0.137	0.104	-0.029
	0.017	*0.134*	*0.833*	*0.172*	*0.539*	*0.391*	*0.046*	*0.431*	*0.507*	*0.267*	*0.186*	*0.322*	*0.065*	*0.159*	*0.696*
Hazard - Blizzards	0.088	-0.029	-0.064	-0.032	0.113	0.132	-0.024	-0.044	-0.035	-0.036	**0.171**	-0.039	**0.218**	**0.178**	-0.020
	0.237	*0.692*	*0.390*	*0.672*	*0.127*	*0.075*	*0.750*	*0.558*	*0.640*	*0.628*	*0.021*	*0.604*	*0.003*	*0.016*	*0.783*
Hazard - Avalanches	0.037	-0.073	**-0.159**	-0.078	-0.121	-0.104	0.047	**0.173**	-0.086	-0.012	0.004	0.129	**0.340**	**0.270**	-0.051
	0.618	*0.324*	*0.032*	*0.292*	*0.104*	*0.163*	*0.529*	*0.019*	*0.245*	*0.877*	*0.956*	*0.082*	*0.000*	*0.000*	*0.494*
Hazard - Dust Storms	-0.094	**-0.151**	-0.093	**-0.161**	**0.147**	**0.481**	-0.065	**-0.223**	-0.135	-0.017	-0.074	-0.117	-0.075	-0.065	-0.105
	0.207	*0.042*	*0.208*	*0.029*	*0.047*	*0.000*	*0.385*	*0.002*	*0.069*	*0.822*	*0.318*	*0.115*	*0.313*	*0.384*	*0.158*
Hazard - Volcanoes	**0.147**	0.125	**0.215**	**0.222**	-0.097	-0.076	0.011	0.044	-0.054	**0.160**	-0.071	0.094	0.043	**0.149**	0.107
	0.047	*0.093*	*0.003*	*0.003*	*0.191*	*0.304*	*0.884*	*0.556*	*0.467*	*0.031*	*0.340*	*0.206*	*0.565*	*0.044*	*0.148*

Correlation at sig.-level .05
Sig. Level (2-sided)

Table B2-2. Correlation Matrix of Items (i)

Correlations	*Number of different Hazards (0-15)*	*Hazard - Earthquakes*	*Hazard - Tsunamis*	*Hazard - Floods*	*Hazard - Mudslides*	*Hazard - Droughts*	*Hazard - Forest Fires*	*Hazard - Storms*	*Hazard - Hurricanes*	*Hazard - Typhoons*	*Hazard - Cyclones*	*Hazard - Tornados*	*Hazard - Blizzards*	*Hazard - Avalanches*	*Hazard - Dust Storms*	*Hazard - Volcanoes*
Number of different Hazards (0-15)	1.000	**0.577**	**0.515**	**0.455**	**0.472**	**0.330**	**0.351**	0.140	**0.185**	**0.148**	**0.158**	**0.227**	0.109	**0.163**	0.063	**0.506**
		0.000	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.058*	*0.012*	*0.046*	*0.032*	*0.002*	*0.143*	*0.027*	*0.395*	*0.000*
Hazard - Earthquakes	**0.577**	1.000	**0.376**	0.059	**0.296**	-0.019	0.065	-0.098	0.042	0.143	0.001	0.043	-0.050	0.009	-0.113	**0.403**
	0.000		*0.000*	*0.427*	*0.000*	*0.796*	*0.380*	*0.185*	*0.575*	*0.053*	*0.993*	*0.565*	*0.503*	*0.907*	*0.129*	*0.000*
Hazard - Tsunamis	**0.515**	**0.376**	1.000	0.059	**0.189**	-0.021	**0.155**	-0.058	0.033	**0.260**	0.085	**0.195**	-0.019	-0.047	-0.096	**0.385**
	0.000	*0.000*		*0.430*	*0.010*	*0.776*	*0.036*	*0.439*	*0.655*	*0.000*	*0.255*	*0.008*	*0.801*	*0.531*	*0.197*	*0.000*
Hazard - Floods	**0.455**	0.059	0.059	1.000	**0.192**	**0.183**	0.101	**0.154**	0.013	-0.091	-0.061	0.034	-0.054	0.125	-0.067	-0.072
	0.000	*0.427*	*0.430*		*0.009*	*0.013*	*0.173*	*0.037*	*0.859*	*0.222*	*0.409*	*0.643*	*0.470*	*0.092*	*0.371*	*0.331*
Hazard - Mudslides	**0.472**	**0.296**	**0.189**	**0.192**	1.000	-0.067	0.071	-0.006	0.049	-0.049	0.005	0.123	-0.027	**0.215**	-0.089	**0.199**
	0.000	*0.000*	*0.010*	*0.009*		*0.366*	*0.337*	*0.932*	*0.513*	*0.508*	*0.951*	*0.098*	*0.713*	*0.003*	*0.228*	*0.007*
Hazard - Droughts	**0.330**	-0.019	-0.021	**0.183**	-0.067	1.000	0.065	0.120	-0.130	**-0.158**	0.001	-0.071	0.110	-0.058	**0.172**	-0.107
	0.000	*0.796*	*0.776*	*0.013*	*0.366*		*0.380*	*0.106*	*0.079*	*0.033*	*0.993*	*0.342*	*0.137*	*0.439*	*0.020*	*0.151*
Hazard - Forest Fires	**0.351**	0.065	**0.155**	0.101	0.071	0.065	1.000	**0.182**	-0.017	-0.068	0.019	**0.219**	**0.326**	0.100	-0.010	0.104
	0.000	*0.380*	*0.036*	*0.173*	*0.337*	*0.380*		*0.014*	*0.821*	*0.361*	*0.798*	*0.003*	*0.000*	*0.178*	*0.893*	*0.161*
Hazard - Storms	0.140	-0.098	-0.058	**0.154**	-0.006	0.120	**0.182**	1.000	-0.090	-0.068	-0.070	-0.024	-0.017	0.100	-0.086	-0.101
	0.058	*0.185*	*0.439*	*0.037*	*0.932*	*0.106*	*0.014*		*0.223*	*0.361*	*0.344*	*0.748*	*0.821*	*0.178*	*0.246*	*0.175*
Hazard - Hurricanes	**0.185**	0.042	0.033	0.013	0.049	-0.130	-0.017	-0.090	1.000	-0.119	-0.123	0.111	-0.029	-0.073	**-0.151**	**0.211**
	0.012	*0.575*	*0.655*	*0.859*	*0.513*	*0.079*	*0.821*	*0.223*		*0.109*	*0.097*	*0.134*	*0.692*	*0.324*	*0.042*	*0.004*
Hazard - Typhoons	**0.148**	0.143	**0.260**	-0.091	-0.049	**-0.158**	-0.068	-0.068	-0.119	1.000	0.049	-0.031	-0.022	-0.055	-0.113	0.137
	0.046	*0.053*	*0.000*	*0.222*	*0.508*	*0.033*	*0.361*	*0.361*	*0.109*		*0.514*	*0.673*	*0.766*	*0.459*	*0.127*	*0.065*
Hazard - Cyclones	**0.158**	0.001	0.085	-0.061	0.005	0.001	0.019	-0.070	-0.123	0.049	1.000	**0.154**	-0.023	-0.057	-0.117	0.072
	0.032	*0.993*	*0.255*	*0.409*	*0.951*	*0.993*	*0.798*	*0.344*	*0.097*	*0.514*		*0.038*	*0.758*	*0.444*	*0.114*	*0.333*
Hazard - Tornados	**0.227**	0.043	**0.195**	0.034	0.123	-0.071	**0.219**	-0.024	0.111	-0.031	**0.154**	1.000	-0.008	-0.019	-0.040	0.095
	0.002	*0.565*	*0.008*	*0.643*	*0.098*	*0.342*	*0.003*	*0.748*	*0.134*	*0.673*	*0.038*		*0.917*	*0.795*	*0.592*	*0.199*
Hazard - Blizzards	0.109	-0.050	-0.019	-0.054	-0.027	0.110	**0.326**	-0.017	-0.029	-0.022	-0.023	-0.008	1.000	-0.014	**0.196**	-0.033
	0.143	*0.503*	*0.801*	*0.470*	*0.713*	*0.137*	*0.000*	*0.821*	*0.692*	*0.766*	*0.758*	*0.917*		*0.855*	*0.008*	*0.659*
Hazard - Avalanches	**0.163**	0.009	-0.047	0.125	**0.215**	-0.058	0.100	0.100	-0.073	-0.055	-0.057	-0.019	-0.014	1.000	-0.070	0.001
	0.027	*0.907*	*0.531*	*0.092*	*0.003*	*0.439*	*0.178*	*0.178*	*0.324*	*0.459*	*0.444*	*0.795*	*0.855*		*0.348*	*0.985*
Hazard - Dust Storms	0.063	-0.113	-0.096	-0.067	-0.089	**0.172**	-0.010	-0.086	**-0.151**	-0.113	-0.117	-0.040	**0.196**	-0.070	1.000	-0.123
	0.395	*0.129*	*0.197*	*0.371*	*0.228*	*0.020*	*0.893*	*0.246*	*0.042*	*0.127*	*0.114*	*0.592*	*0.008*	*0.348*		*0.096*
Hazard - Volcanoes	**0.506**	**0.403**	**0.385**	-0.072	**0.199**	-0.107	0.104	-0.101	**0.211**	0.137	0.072	0.095	-0.033	0.001	-0.123	1.000
	0.000	*0.000*	*0.000*	*0.331*	*0.007*	*0.151*	*0.161*	*0.175*	*0.004*	*0.065*	*0.333*	*0.199*	*0.659*	*0.985*	*0.096*	

Correlation at sig.-level .05
Sig. Level (2-sided)

Table B2-3. Selection of Factor Model

LC Factor Model (Climate, Geography, Hazards)	*Indicators*	*LL*	*BIC (LL)*	*# Parameters*	*Class. Error*
1-DFactor(2)	all	-8,571	17,694	106	0.0206
2-DFactor(2,2)	all	-8,344	17,485	153	0.0112
3-DFactor(2,2,2)	all	-8,155	17,352	200	0.0006
4-DFactor(2,2,2,2)	all	-7,923	17,132	247	0.0000
5-DFactor(2,2,2,2,2)	all	-7,869	17,270	294	0.0000
6-DFactor(2,2,2,2,2,2)	all	-7,396	16,568	341	0.0000
7-DFactor(2,2,2,2,2,2,2)	all	-7,333	16,687	388	0.0000
4-DFactor(2,2,2,2)*	**w/o Counts**	**-7,339**	**15,913**	**237**	**0.0000**
5-DFactor(2,2,2,2,2)	w/o Counts	-7,298	16,065	282	0.0000
4-DFactor(2,2,2,2)	w/o Counts &	-7,498	16,199	231	0.0000
5-DFactor(2,2,2,2,2)	Elev. HiPlains	-7,380	16,193	275	0.0000

** With -2LL=82.2424 Difference of 5-DFactor model at p=.09 level n. sig.*

Table B2-4. Factor Loadings

Factor Loadings (Climate, Geography, Hazards)	*DFactor 1*	*DFactor 2*	*DFactor 3*	*DFactor 4*	*R^2*
Forrested Land	-0.2036	0.0633	-0.1109	0.0108	0.0579
Arable Land	0.0475	-0.1122	0.0000	0.0174	0.0151
Highest Elevation (m)	-0.0336	0.2271	0.4892	0.6339	0.6938
Lowest Elevation (m)	-0.1074	-0.1350	-0.0491	0.2358	0.0878
Average Elevation (m)	0.2204	-0.1439	0.3405	0.6126	0.5605
Elevation above 4000m	-0.0576	0.0830	0.8670	0.0199	0.7623
Elevation above 2000m	-0.0087	-0.1024	0.3282	0.4624	0.3321
Elevation above 1000m	-0.1185	0.0260	-0.0607	0.5398	0.3098
Elevation above 400m (Uplands)	-0.0138	0.0101	-0.0999	0.3187	0.1119
Elevation High Plateau	0.0012	-0.0843	-0.1298	0.3017	0.1150
Elevation Low Plains	0.0107	0.0453	-0.0949	-0.7282	0.5414
Elevation Depression	0.9472	-0.0020	-0.0058	0.0281	0.8979
Land Area (sqkm)	-0.5073	0.8136	0.0209	0.0917	0.9281
Landlocked (1/0)	0.2490	0.0995	0.0115	0.2756	0.1518
Island (1/0)	0.0742	0.0057	0.1111	0.3286	0.1326
Climate - Af (moist)	0.0567	0.0087	0.0417	0.0008	0.0051
Climate - Am (Monsoon)	0.1157	0.0341	0.0158	0.2123	0.0606
Climate - Aw (Dry Season)	0.0593	0.0066	0.1055	0.0295	0.0158
Climate - Bs (Steppe)	0.0731	0.3456	0.1678	0.2947	0.2461
Climate - Bw (Desert)	0.0135	0.3006	0.1719	0.2261	0.1727
Climate - C (Temperate)	0.0507	0.2462	0.0818	0.1538	0.1028
Climate - Cw (Winter Dry)	0.0923	0.1864	0.0197	0.1557	0.0693
Climate - Cs (Summer Dry)	0.0589	0.0501	0.1820	0.2383	0.1000
Climate - Cf (Moist)	0.0547	0.2336	0.0482	0.2181	0.1099
Climate - D (Cold)	0.0336	0.1716	0.0888	0.1615	0.0667
Climate - Df (Moist)	0.0794	0.1188	0.1196	0.1113	0.0483
Climate - Dw (Winter Dry)	0.0540	0.2751	0.0233	0.3604	0.2930
Climate - ET (Tundra)	0.0636	0.2400	0.2325	0.3681	0.3082
Climate - EF (Arctic)	0.0398	0.2504	0.2420	0.2679	0.3315
Hazard - Earthquakes	0.0975	0.0528	0.1677	0.3485	0.1624
Hazard - Tsunamis	0.0382	0.1625	0.1132	0.1936	0.0999
Hazard - Floods	0.0750	0.1292	0.2093	0.0390	0.0680
Hazard - Mudslides	0.1412	0.0170	0.0653	0.2061	0.0703
Hazard - Droughts	0.0064	0.0820	0.0764	0.0538	0.0155
Hazard - Forest Fires	0.0400	0.4284	0.0619	0.1710	0.2770
Hazard - Storms	0.0143	0.0536	0.1710	0.0080	0.0341
Hazard - Hurricanes	0.0582	0.0451	0.0903	0.1640	0.0430
Hazard - Typhoons	0.0456	0.0730	0.0401	0.0939	0.0187
Hazard - Cyclones	0.0502	0.2398	0.0755	0.1037	0.0844
Hazard - Tornados	0.0198	0.3273	0.0304	0.0047	0.1177
Hazard - Blizzards	0.0061	0.0183	0.0185	0.0813	0.0082
Hazard - Avalanches	0.0146	0.0455	0.0459	0.2022	0.0505
Hazard - Dust Storms	0.2895	0.0646	0.0094	0.0401	0.0904
Hazard - Volcanoes	0.0665	0.0760	0.0559	0.0796	0.0201

B3 - Factors on Political Situation.

In our sample, 16 time-invariant items describe each of the 183 countries.

Table B3-1. Descriptives on Items

Descriptive Statistics	*Mean*	*Std. Dev.*	*Min.*	*Max.*
Avg. Civil War	0.016	0.091	0.0	0.8
Avg Democratic Institution Index	5.757	3.703	0	10
Dummy Government - Democratic	0.530	0.500	0	1
Dummy Government - Federal Democracy	0.087	0.283	0	1
Dummy Government - Dependent Democracy	0.104	0.306	0	1
Dummy Government - Transition	0.016	0.127	0	1
Dummy Government - Absolute Monarchy	0.033	0.179	0	1
Dummy Government - Dictatorship	0.033	0.179	0	1
Dummy Government - PseudoDemocracy	0.197	0.399	0	1
Dummy Government - Autonomous State	0.896	0.306	0	1
Dummy Government - Dependency British Crown	0.027	0.163	0	1
Dummy Government - Dependency France	0.038	0.192	0	1
Dummy Government - Dependency USA	0.027	0.163	0	1
Dummy Government - Dependency Denmark	0.016	0.104	0	1
Dummy Government - Dependency Netherlands	0.011	0.104	0	1
Dummy Government - Dependency China	0.011	0.104	0	1

Table B3-2. Correlation Matrix of Items (a)

Correlations	Avg. Civil War	Avg Democratic Institution Index	Dummy Government - Democratic	Dummy Government - Federal Democracy	Dummy Government - Dependent Democracy	Dummy Government - Transition	Dummy Government - Absolute Monarchy	Dummy Government - Dictatorship	Dummy Government - PseudoDemocracy
Avg. Civil War	1.000	-0.119	-0.029	0.122	-0.059	0.083	-0.032	-0.032	-0.003
		0.108	0.699	0.101	0.429	0.261	0.669	0.669	0.965
Avg. Democratic Institution Index	-0.119	1.000	**0.376**	**0.168**	**0.313**	**-0.196**	**-0.287**	**-0.246**	**-0.532**
	0.108		0.000	0.023	0.000	0.008	0.000	0.001	0.000
Dummy Government - Democratic	-0.029	**0.376**	1.000	**-0.329**	**-0.361**	-0.137	**-0.196**	**-0.196**	**-0.526**
	0.699	0.000		0.000	0.000	0.064	0.008	0.008	0.000
Dummy Government - Federal Democracy	0.122	**0.168**	**-0.329**	1.000	-0.105	-0.040	-0.057	-0.057	**-0.153**
	0.101	0.023	0.000		0.156	0.591	0.444	0.444	0.038
Dummy Government - Dependent Democracy	-0.059	**0.313**	**-0.361**	-0.105	1.000	-0.044	-0.063	-0.063	**-0.168**
	0.429	0.000	0.000	0.156		0.555	0.399	0.399	0.023
Dummy Government - Transition	0.083	**-0.196**	-0.137	-0.040	-0.044	1.000	-0.024	-0.024	-0.064
	0.261	0.008	0.064	0.591	0.555		0.749	0.749	0.390
Dummy Government - Absolute Monarchy	-0.032	**-0.287**	**-0.196**	-0.057	-0.063	-0.024	1.000	-0.034	-0.091
	0.669	0.000	0.008	0.444	0.399	0.749		0.649	0.220
Dummy Government - Dictatorship	-0.032	**-0.246**	**-0.196**	-0.057	-0.063	-0.024	-0.034	1.000	-0.091
	0.669	0.001	0.008	0.444	0.399	0.749	0.649		0.220
Dummy Government - PseudoDemocracy	-0.003	**-0.532**	**-0.526**	**-0.153**	**-0.168**	-0.064	-0.091	-0.091	1.000
	0.965	0.000	0.000	0.038	0.023	0.390	0.220	0.220	
Dummy Government - Autonomous State	0.059	**-0.313**	**0.361**	0.105	**-1.000**	0.044	0.063	0.063	**0.168**
	0.429	0.000	0.000	0.156	0.000	0.555	0.399	0.399	0.023
Dummy Government - Dependency British Crown	-0.029	**0.193**	-0.111	-0.052	**0.383**	-0.022	-0.031	-0.031	-0.083
	0.697	0.009	0.135	0.486	0.000	0.771	0.678	0.678	0.264
Dummy Government - Dependency France	-0.034	**0.175**	**-0.155**	-0.062	**0.493**	-0.026	-0.037	-0.037	-0.099
	0.643	0.018	0.037	0.406	0.000	0.729	0.622	0.622	0.184
Dummy Government - Dependency USA	-0.029	**0.193**	**-0.178**	0.067	**0.383**	-0.022	-0.031	-0.031	-0.083
	0.697	0.009	0.016	0.369	0.000	0.771	0.678	0.678	0.264
Dummy Government - Dependency Denmark	-0.022	**0.148**	-0.051	-0.040	**0.238**	-0.017	-0.024	-0.024	-0.064
	0.764	0.045	0.494	0.591	0.001	0.823	0.749	0.749	0.390
Dummy Government - Dependency Netherlands	-0.018	0.121	-0.006	-0.033	0.137	-0.014	-0.019	-0.019	-0.052
	0.807	0.103	0.932	0.662	0.065	0.855	0.795	0.795	0.484
Dummy Government - Dependency China	-0.022	-0.085	-0.137	-0.040	**0.238**	-0.017	-0.024	**0.218**	-0.064
	0.764	0.254	0.064	0.591	0.001	0.823	0.749	0.003	0.390

Correlation at sig.-level .05
Sig. Level (2-sided)

Table B3-2. Correlation Matrix of Items (b)

Correlations	Dummy Government - Autonomous State	Dummy Government - Dependency British Crown	Dummy Government - Dependency France	Dummy Government - Dependency USA	Dummy Government - Dependency Denmark	Dummy Government - Dependency Netherlands	Dummy Government - Dependency China
Avg. Civil War	0.059	-0.029	-0.034	-0.029	-0.022	-0.018	-0.022
	0.429	0.697	0.643	0.697	0.764	0.807	0.764
Avg. Democratic Institution Index	**-0.313**	**0.193**	**0.175**	**0.193**	**0.148**	0.121	-0.085
	0.000	0.009	0.018	0.009	0.045	0.103	0.254
Dummy Government - Democratic	**0.361**	-0.111	**-0.155**	**-0.178**	-0.051	-0.006	-0.137
	0.000	0.135	0.037	0.016	0.494	0.932	0.064
Dummy Government - Federal Democracy	0.105	-0.052	-0.062	0.067	-0.040	-0.033	-0.040
	0.156	0.486	0.406	0.369	0.591	0.662	0.591
Dummy Government - Dependent Democracy	**-1.000**	**0.383**	**0.493**	**0.383**	**0.238**	0.137	**0.238**
	0.000	0.000	0.000	0.000	0.001	0.065	0.001
Dummy Government - Transition	0.044	-0.022	-0.026	-0.022	-0.017	-0.014	-0.017
	0.555	0.771	0.729	0.771	0.823	0.855	0.823
Dummy Government - Absolute Monarchy	0.063	-0.031	-0.037	-0.031	-0.024	-0.019	-0.024
	0.399	0.678	0.622	0.678	0.749	0.795	0.749
Dummy Government - Dictatorship	0.063	-0.031	-0.037	-0.031	-0.024	-0.019	**0.218**
	0.399	0.678	0.622	0.678	0.749	0.795	0.003
Dummy Government - PseudoDemocracy	**0.168**	-0.083	-0.099	-0.083	-0.064	-0.052	-0.064
	0.023	0.264	0.184	0.264	0.390	0.484	0.390
Dummy Government - Autonomous State	1.000	**-0.383**	**-0.493**	**-0.383**	**-0.238**	-0.137	**-0.238**
		0.000	0.000	0.000	0.001	0.065	0.001
Dummy Government - Dependency British Crown	**-0.383**	1.000	-0.033	-0.028	-0.022	-0.018	-0.022
	0.000		0.653	0.706	0.771	0.813	0.771
Dummy Government - Dependency France	**-0.493**	-0.033	1.000	-0.033	-0.026	-0.021	-0.026
	0.000	0.653		0.653	0.729	0.778	0.729
Dummy Government - Dependency USA	**-0.383**	-0.028	-0.033	1.000	-0.022	-0.018	-0.022
	0.000	0.706	0.653		0.771	0.813	0.771
Dummy Government - Dependency Denmark	**-0.238**	-0.022	-0.026	-0.022	1.000	-0.014	-0.017
	0.001	0.771	0.729	0.771		0.855	0.823
Dummy Government - Dependency Netherlands	-0.137	-0.018	-0.021	-0.018	-0.014	1.000	-0.014
	0.065	0.813	0.778	0.813	0.855		0.855
Dummy Government - Dependency China	**-0.238**	-0.022	-0.026	-0.022	-0.017	-0.014	1.000
	0.001	0.771	0.729	0.771	0.823	0.855	

Correlation at sig.-level .05
Sig. Level (2-sided)

Table B3-3. Selection of Factor Model

LC Factor Model (Political)	*LL*	*BIC (LL)*	*# Parameters*	*Class. Error*
2-DFactor(2,2)	-622.621	1,516	52	0.0001
3-DFactor(2,2,2)	-486.413	1,332	69	0.0000
4-DFactor(2,2,2,2)*	**-328.495**	**1,105**	**86**	**0.0000**
5-DFactor(2,2,2,2,2)	-312.234	1,161	103	0.0000
6-DFactor(2,2,2,2,2,2)	-250.426	1,126	120	0.0000
7-DFactor(2,2,2,2,2,2,2)	-210.439	1,135	137	0.0000

** With -2LL Difference to 3-Dfactor model at 315.8358 sig. at p=.0000 level*

Table B3-4. Factor Loadings

Factor Loadings (Political)	*DFactor 1*	*DFactor 2*	*DFactor 3*	*DFactor 4*	*R^2*
Avg. Civil War	0.7641	0.6167	-0.0054	0.0006	0.9642
Avg Democratic Institution Index	-0.0411	-0.1096	0.1084	-0.7643	0.6096
Dummy Government - Democratic	0.0928	0.0221	0.4225	0.6681	0.7091
Dummy Government - Federal Democracy	0.1176	0.0109	0.1228	0.1162	0.0480
Dummy Government - Dependent Democracy	0.0118	0.0149	0.8116	0.2095	0.9738
Dummy Government - Transition	0.0181	0.3174	0.0346	0.2114	0.3962
Dummy Government - Absolute Monarchy	0.0219	0.0274	0.0714	0.2801	0.1005
Dummy Government - Dictatorship	0.0251	0.0327	0.4967	0.3109	0.9738
Dummy Government - PseudoDemocracy	0.0440	0.0780	0.1880	0.7448	0.7000
Dummy Government - Autonomous State	0.0118	0.0149	0.8116	0.2095	0.9738
Dummy Government - Dependency British Crown	0.0088	0.0205	0.3016	0.1037	0.1417
Dummy Government - Dependency France	0.0110	0.0223	0.3915	0.1230	0.2349
Dummy Government - Dependency USA	0.0088	0.0205	0.3016	0.1037	0.1417
Dummy Government - Dependency Denmark	0.0058	0.0177	0.1834	0.0804	0.0553
Dummy Government - Dependency Netherlands	0.0033	0.0156	0.1004	0.0660	0.0192
Dummy Government - Dependency China	0.0139	0.0189	0.3198	0.0283	0.1121