DIFFUSION MODELS AND GLOBAL CIVIL SOCIETY

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Each edition of the Yearbook includes a Chapter that explores methodological approaches to global civil society from different social science perspectives. These Chapters are motivated by a belief that understanding globalisation requires approaches outside the conventional system of social science data reporting and analysis: globalisation creates new institutions, organisations, networks and communities, and their corresponding cultural and behavioural patterns, including problems of many kinds, that transcend traditional policymaking. These institutions, patterns and problems not only cut across the nation state and related units, but they increasingly create and reflect social realities that are sui generis.

Globalisation is more than the 'sum' of national societies and economies or their international aspects. It is something qualitatively and quantitatively different, and something that ultimately challenges the assumed equivalence between nation state, domestic economy, and national society. In our opinion (Centre for the Study of Global Governance 2001; Center for Civil Society 2006) as well as those of others (Beck 2002; Detlef 2006), this has profound implications for social science methodologies that require fresh approaches and innovative thinking in exploring how available social science methods can be applied to the study of globalisation.

Consequently, beginning with its inaugural edition, each Yearbook takes on a distinct methodological issue or approach: we have addressed the operational definition of global civil society (Anheier 2001), developed the Global Civil Society Index (Anheier and Stares 2002), presented geographic information systems (Anheier and Katz 2003), and introduced social network analysis (Anheier and Katz 2004) to the study of global civil society. More recently we proposed applying comparative historical methodologies such as event structure analysis, qualitative-comparative analysis and fuzzy sets approaches to examine global civil society (Anheier and Katz 2005; Katz, Anheier and Lam 2006).

In this edition of the Yearbook, we look at diffusion models and related approaches, and illustrate their utility for understanding the essential features of global civil society: the dynamics of information flows, the spread of ideas and innovation, behavioural patterns, forms of organising, advocacy and protest. Diffusion can take place between centres and peripheries, elites and more marginal groups, and among actors who find themselves in coalitions or caught in conflict with each other. Diffusion is not necessarily top-down or from centre to periphery. On the contrary, many innovations take place at the crossroads, if not at the margins, of social systems rather than their centres. Indeed, in the context of globalisation, with an increase in cross-border exchanges of institutions and knowledge, diffusion often takes place via horizontal channels rather than hierarchical ones.

What in the previous paragraph may appear, at first sight, as rather abstract social processes are in fact the lived reality of a globalising world: for example, reactions to the publication of the cartoons depicting illustrations of Muhammad in the Danish newspaper *Jyllands-Posten*, on 30 September 2005, illustrate an instance of diffusion facilitated by globalisation, here in the field of media and communication: local reactions to a provincial publication, at first somewhat isolated and sparse, achieve national and then transnational prominence, and ultimately high policy salience across the globe, with protests turning increasingly violent, creating significant property damage, leaving many people dead, and affecting relations between Denmark, the EU and 'the West' on the one side, and Islam and the Arab world on the other. Other examples include the spread of suburban riots in French cities to other parts of Europe in 2005/6, the organisation of the global anti-Iraq protests in February of 2003, or the copycat effects of protest tactics (for example, the series of self-immolation protests against war, or the spread of demonstrations outside the homes of executives in the cosmetics industry).

Of interest here are questions such as, how is information disseminated among individuals and

organisations that may or may not be connected with each other? What is the role of outside actors such as the media in pushing innovations and changes in groups or organisations? What links people and organisations in order to create common responses, or encourages copycat behaviour? What is behind the rapid diffusion of rumours and misinformation in some cases, and their containment in others? Why are some innovative ideas widely adopted while others are not? How do protest movements spread transnationally, and why do some turn violent while others remain peaceful?

Of course, these are complex questions, and we will not be able to answer them fully. What we seek to explore are aspects relating to the patterns and dynamics of diffusion processes involved in each question, and the basic empirical fact underlying these questions: globalisation facilitates the diffusion of information, values and behavioural patterns, and vice versa. The questions also imply that diffusion occurs neither evenly nor at equal pace across units, time and space; on the contrary, there are distinct patterns of diffusion that involve different thresholds of adoption and dissemination, thereby yielding characteristic processes, structures and outcomes.

Indeed, the notion of diffusion is frequently evoked in the globalisation literature, either implicitly or explicitly: prominent examples include Giddens (1990) and Harvey (1989), who argue that a general time-space compression makes interactions among previously unconnected entities more instantaneous and less likely to be held up by distance. Such compression also makes diffusion patterns less predictable than in the past. Other factors and consequences of diffusion, such as ease of information flows, new communication technologies, exchange of ideas, trade, cooperation and conflict are often mentioned, which Held et al. (1999) describe in terms of interaction extensity, intensity and volume. Similarly, the metaphor of the 'woven world' by Yergin and Stanislav (1998) expresses how transnational actors connect formerly disparate entities and issues, so everything becomes relevant everywhere – again, a pattern of greater connectivity both encouraging and changing diffusion processes. Castells (1996) put forth the idea of a global 'network society' in which processes occur in a 'space of flows' rather than conventional geographic-political space. Another example of the implicit use of diffusion ideas in the globalisation literature is Beck (1999) who describes globalisation as transmission belts that intersect more frequently in some regions of the world than in others, thereby creating a pattern of varying density and centrality in terms of interactions and flows.

Empirical research of dissemination and globalisation has slowly followed, much of it inspired by the groundbreaking work of Rogers (2003) who presented a model of how innovations spread through social systems. Understanding how diffusion works is most critical if the information disseminated is of significance and has the potential for change. For this reason, researchers emphasize the link between innovation and diffusion. According to Rogers (2003: 12), an innovation is '... an idea, practice, or object that is perceived as new by an individual or other unit of adoption,' whereas diffusion is a particular type of communication about innovation, and the process in which an innovation is communicated through certain channels over time among the members of that system. In this sense, diffusion is the fourth consecutive component of innovation after the stages of initiation, creation and implementation.

It also helps to think of innovation in a broader sense. For example, an activist may succeed in linking local issues (like labour market policies perceived as discriminatory by youths in French suburbs) to global ones (perceived Western attempts to dominate Islam or the Middle East) in ways that are convincing to other local activists and potential followers, and in ways that make this 'message' of potential interest to other groups in France or elsewhere where conditions may be similar. Sociologists use the term 'framing' to show how activists turn complex political realities into 'sense-making' interpretations, and the term 'political opportunity structures' to illustrate how activities use such frames to create communicable themes around issues when attaching them to perceived weaknesses in the political system and its governance structure. For diffusion models it matters little if the idea, practice or object is truly new; what matters most is that 'something' is seen as worthy of adoption by others and therefore begins a process of spreading within and across populations.

A basic assumption of Rogers' diffusion model is that innovations spread along established lines of social interaction and institutional system, that is, they follow some structure. Research has confirmed this, and also demonstrated that globalisation greatly

facilitates diffusion processes: Soule (1997), Strang and Soule (1998), Ayers (1999) and Chabot (2004) among others, have used Rogers' framework or aspects and modifications thereof to model the diffusion of global civil society process such as social movements, protests, and collective action. Tarrow (2001) argues that with the waning of the Cold War, the diffusion of transnational non-governmental organisations (NGOs) as a model of organising in the 1980s and 1990s opened up the field of transnational politics and took it in new directions. Potoski and Prakash (2004) examine how globalisation facilitated the broad diffusion of ISO 14001, the non-governmental regime of environmental standards, across many countries. They find that ISO diffusion is both a result of, and patterned by, economic globalisation in the form of trade flows, political globalisation in the form of transnational governmental and non-governmental networks, and the pervasiveness of the Internet as a vehicle to encourage self-regulatory regimes of compliance rather than third party control.

Diffusion models are also a useful response to address what methodologists have long identified as 'Galton's problem', which was posited as one of the main issues affecting research into globalisation and global civil society (Anheier and Katz 2005). Galton's problem concerns the analysis of social units and actors as if they are independent entities, while in actuality they are dependent on each other, and are part of a larger structure of relations that are activated or enacted through diffusion processes. According to Detlef (2006) dependence among units/entities is inherent in many diffusion processes, and analysing them takes into account the influences between actors and entities as part of a complex association between structures and flows. Thus, analysing diffusion in transnational settings can help identify the emergent systems of non-contiguous institutions, organisations and individuals of a globalising world. Against this background, we will explore some basic notions and components of diffusion models.[1]

Diffusion Models

Diffusion models have become a rather technical and statistically demanding field in a number of the social sciences, especially sociology and economics, with applications in communications research, marketing, and technological as well as economic development. The basic idea underlying diffusion models, however, is relatively simple: diffusion is the spreading of a phenomenon from one unit to another, and diffusion models analyse the dynamics, patterns and outcome of this process (Mahajan & Peterson 1985).

There are various ways in which the spread of a phenomenon can occur, in particular whether the diffusion process is exogenous (induced from the outside) or endogenous (from within) or both. Furthermore, the phenomenon spreading in diffusion models can be dichotomous or continuous in the sense that different entities can be more or less associated with the phenomenon in question.

Together these entities or units, whether they innovate, adopt, spread or block the innovation, comprise a system that defines the boundaries between exogenous and endogenous change. Entities within the system must have the potential capacity of incorporating or adopting the phenomenon; all others without such capacity are outside the system. However, system units do not need to be located in the same place; they may well be in non-contiguous spaces and located in rather different cultural, economic and political contexts. Methodologically speaking, the system is a set of entities actually or potentially being able to incorporate the object of diffusion, irrespective of their location in space (although spatial proximity may affect diffusion, a tendency that various diffusion methodologies take into account).

Another important element in diffusion models is the medium or the agent in and through which phenomena such as information or innovations 'travel.' This includes a wide range of agents, from exogenous influences such as advertising agencies, and communication and the media generally, to endogenous agents such as persons communicating with each other, gossip, organisations exchanging formal information via the Internet, or one NGO executive observing another at a professional meeting.

[1] *Diffusion models can also address another methodological issue raised by Anheier and Katz (2006) – the 'black box' problem. While often social science methodologies take an input-output approach that does not examine the processes between the input and the output (hence the 'black box'), diffusion models focus not only on structures and behaviours, but also on the actual causal process by which they are generated.*

The basic diffusion model

The basic diffusion model posits that the rate of diffusion is a function of the difference between the total number of possible adopters in the system and the number of previous adopters at that time. The diffusion occurs at a specific rate from one entity in the set to another without regard to variations in the units themselves. Such thinking has a mechanistic, even deterministic feel to it, and may not reflect reality very well.[2] However, the basic diffusion model is a useful staring point. This model is expressed as a differential equation that represents the rate of diffusion:

$$dN(t) / dt = g(t) [N^* - N(t)],$$

where N(t) are the number of entities that have incorporated the phenomenon at time t; N^* is the total number of entities that could eventually adopt it, i.e. N^* is the full set of units in the system; and g(t) the coefficient of diffusion at a given time (see below). At time zero (t=0), N(t) is equal to the number of entities in the system that have initially incorporated the phenomenon of diffusion either as innovators or first adaptors. Throughout the process, the rate of diffusion dN(t)/dt will depend on the number of units that have not yet adopted the object of diffusion or remain resistant as such. Conceptually, the most critical component of the basic diffusion model is the coefficient of diffusion g(t), which can be defined in different ways. As we will see, each definition gives way to different diffusion models that offer different conceptualisations of the very nature of the diffusion process.

The external-influence diffusion model

The simplest variant is to set g(t) as a constant (k), which has the object of diffusion spread through the system at a set rate. Very likely, the constant k represents the influence of external agents rather than the rate of prior adoptions or their impact on non-adopters. Put differently, people or organisations are exposed to a constant flow of messages from outside, and this is what causes them to adopt an innovation, not direct interaction with previous adopters. For this reason, the resulting pattern of the external-influence diffusion model is a decaying exponential diffusion curve for cumulative adoptions (inverted 'elbow' function), presented in Figure M1. Over time, the cumulative rate of adoptions increases, albeit at a constant rate, and the rate of diffusion at any given time is dependent only on the strength of external pressures at that moment.

The model is important for what it does not take into account: namely, interactions between prior, current and potential adopters among the entities in the system. For this very reason, the process is 'driven' by outside agents and their influences. Prime examples of this process are the effects of mass media communications (radio, TV, advertising, propaganda etc) on the diffusion of information and awareness-building campaigns across a given population. As a general rule, the external influence model is useful and appropriate when (a) entities in the system are relatively isolated and have little chance or interest of direct communication; (b) the phenomenon to be disseminated is rather simple and does not require inter-personal validation; and (c) adequate information about the phenomenon is mostly available outside the system (Mahajan and Peterson 1985).

The internal-influence diffusion model

Whereas the external-influence model assumes that all entities in the system are basically identical and in a similar structural position vis-à-vis the external agent in question, the internal-influence model takes a different starting point. Here, g(t) is seen as an index of imitation (l), taking into account the interaction between prior adopters N(t) and potential adopters ($N^* - N(t)$). In this case, the rate of diffusion is interaction-based; it is a purely endogenous process, a form of communication in which entities transmit the object of diffusion to each other. The more units that incorporate the object, the greater the opportunity for further diffusion among the declining pool of potential adopters.

This is the process presented in Figure M2. The figure shows an S-shaped curve of cumulative adoptions along a time dimension, which depicts a characteristic pattern of diffusion processes. The reasons for this regularity are straightforward: since adoption is a result of interaction, initially only a few entities can adopt the innovation (Rogers 2003, refers to these as 'innovators'); over time the diffusion

[2] *More advanced models are stochastic and allow for variations in the probabilities associated with diffusion from one entity to another.*

Figure M1: External-influence diffusion curve

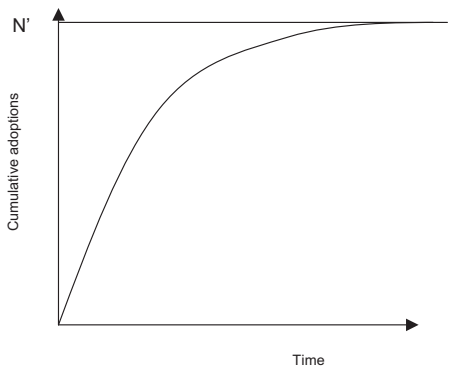
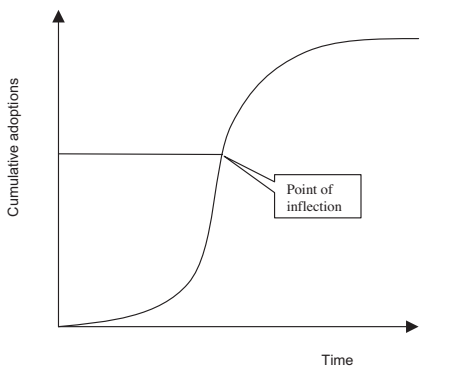


Figure M2: The internal-influence model S-shaped diffusion curve



process unfolds more fully as increasing numbers of previous adopters mean that more adoptions can take place. Finally, as more and more entities have adopted and fewer and fewer have not yet (or will not) (Rogers refers to these as 'laggards'), the increase in new adopters begins to slow, and the cumulative curve of adoptions eventually levels off. So, the internal diffusion curve starts with a rapid increase until a point of inflection where the number of entities that have incorporated the phenomenon equals the number that have not. After the inflection point the rate of diffusion decreases and begins to level off.

The internal-influence model describes a contagion process, and is most appropriate in cases where the innovation or the phenomenon to be adopted is both complex and visible, and the system is rather homogeneous, with a need for inter-personal validation and legitimating information (Mahajan and Peterson 1985).

Further expansions of diffusion models

The external and internal models are highly stylised versions of diffusion processes. In reality, it is probable that internal and external influences operate in tandem. Mixed models try to take account both processes, yielding many variations in both conceptual and mathematical terms that go well beyond what this Chapter can achieve. In mixed models, g(t) is a product m of the external constant k and the internal constant l, although the way the product is calculated depends on the specific model used. The mixed influence model also has a characteristic S-shaped curve.

Other models treat the fixed inflection point of .5 at which diffusion is maximised and the symmetry of cumulative adoptions in more flexible ways. This can be achieved either by adding an exponent to the basic diffusion rate equation (see above), or by adding a coefficient that varies the influence entities have over each other in the course of the diffusion process (thus making for a variable coefficient of diffusion). In one such modified model, early adopters have more influence over each other, and their influence decreases as more entities incorporate the innovation or information in question.

Another expansion of the basic models addresses the fixed number of entities in the system. It is often unrealistic to assume that N' is constant over the diffusion process, given the complexity of transnational systems and the frequent overlaps among groups from contiguous and non-contiguous settings. For example, as we will see below, the entities (number and types of groups and people) reacting to the Danish cartoons were not fixed but increased in number and changed in composition over time as the crisis unfolded. To take account of such developments, N' is seen as a function of factors relating to changes in population size and composition. These factors may be based on variables within the system itself (for example, the number of relations that groups have with outside organisations) as well as other systems (for example, organisations

eager to join the system or that strategically employ diffusion processes for their own purposes).

The models briefly introduced above assume that diffusion processes are independent of each other. In reality, however, this may rarely be the case. The Danish Cartoons crisis did not occur in isolation from other processes such as the mobilisation of Islamic groups after the Iraq War, or the use of the Internet as a mode of communication for protest movements. A more obvious example would be the diffusion of personal computers, the Internet, WiFi, and telephony technologies as highly interdependent processes with partially overlapping time lines. Mahajan and Peterson (1985) suggest four different types of relationships among diffusion objects:

- Functionally independent but mutually enhancing, e.g. Islamic resurgence and anti-globalisation resistance
- Complementary, in that one enhances adoption of the other, such as the way that the spread of the social forums phenomenon enhances the emergence of the anti-globalisation movement and vice-versa
- Contingent, in that adoption of one depends upon incorporation of the other, such as with the emergence of the free software movement and the Internet
- Substitutable, in that one replaces the other, such as the way in which legal action has substituted the use of more traditional organising techniques such as mass mobilisation in some policy areas.

This perspective gives rise to multi-innovation diffusion models where adoption rates and the cumulative number of adoptions become contingent on multiple processes unfolding either simultaneously or partially separated in time but across similar non-contiguous spaces.

An important assumption in diffusion models is homogeneity of system entities, according to which it is assumed that individuals' preferences and incentives are uniform. This assumption runs up against two characteristics of social systems, their internal differences in terms of the values, norms, attitudes and behaviours; and the contingency of decision by individual and groups on others. Indeed, diffusion researchers like Rogers (2003) show how critical the degree of similarity among entities is for accepting, rejecting or modifying innovations, including information generally. The terms homophily and heterophily are used to describe the extent to which entities are alike or unlike for diffusion purposes. Homophily is the degree to which two or more individuals who interact are similar in certain attributes, such as beliefs, education, socio-economic status etc. Sociological studies have shown that in free-choice situations, when individuals can interact with any one of a number of other individuals, the tendency is to select those who are similar. By contrast, heterophily is defined as the degree to which two or more individuals who interact are different in certain attributes (for a fuller discussion of homophily and heterophily see Burt 2005).

Clearly, homophilious communication processes yield diffusion patterns different from heterophilious ones. In the former, an innovation is more likely to remain within the defined social systems and would very likely give rise to the S-shaped curve, whereas in the latter, it is more likely to spread widely across systems but also more 'thinly,' slowly and unevenly. For example, the reactions to the Danish Cartoons crisis involved groups that were increasingly heterophilious, showing political and cultural 'jumps' and unevenness in geographical coverage and penetration. By contrast, we can assume that the suburban riots in French suburbs did not spread as much because protests remained with rather homophilious groups of disenchanted immigrant youths.

Threshold models address the presumed homogeneity in terms of individual decision making. Granovetter's (1978) groundbreaking work presents a model that attempts to capture a situation in which an individual or group makes a decision to adopt an innovation or any other object of diffusion only if a certain number of other entities incorporate it first. A threshold is the number of prior adoptions an individual requires before making the positive decision to adopt the object. With a small number of variables, threshold models can help shed light on seemingly enigmatic situations in crowd behaviour such as demonstrations and protest movements.

Granovetter (1978) presents a thought experiment where 100 people milling about a plaza have to make a decision whether to riot or not. In this crowd, each individual, having a unique number from 0 to 99, has a 'riot joining threshold' equivalent to their respective

number. Thus, the individual with number 0 will immediately start a riot. Then individual 1, seeing person 0 rioting, will join in, followed by person 2 (needing two people to riot to make a decision to join in), will become part of the rioting group, and so on, until person 99 joins. It is a linear function of individual thresholds that very much like a domino effect turns a group of 'peaceful demonstrators' into a 'rioting menace' 100 strong.

Now imagine that individual 1 has a threshold of 2 instead of 1, but everybody else's threshold remains identical. Then, when person 0 start to riot, no one else will, as one individual's threshold, the critical link, has been changed. Thus, no riot will ensue, even though the distribution of thresholds changed only by 1%. Such cases can help understand why riots break out in some situations but not in others: very small changes in 'thresholds,' i.e. people's decisions, can have dramatic and massive implications. Moreover, thresholds may not be constant and reflect learned behaviour and experiences over time.

Analytic approaches to Diffusion Models

A major development since the 1990s has been to apply various analytic approaches and methodologies in the study of diffusion, and in particular spatial effects analysis models and event history analysis.

Spatial effects analysis focuses on the spatial aspects of social diffusion (Land and Deane 1992; Land, Deane, and Blau 1991; Tolnay 1995; Tolnay, Deane, and Beck 1996; Morenoff and Sampson 1997), and assumes that the diffusion process in a given system is affected by similar processes in nearby or adjacent areas. In a sense, spatial effects models view diffusion processes as part of macro contagion models, where one process can influence others as well as being influenced by them. Spatial effects models are sometimes combined with event history approaches, which allows diffusion models to take on a considerably more dynamic character, with multiple events unfolding along different dimensions (Strang and Tuma 1993; Greve et al. 1995). This research has produced evidence that contagion effects are indeed operating in waves rather than as isolated events (as shown, for example, by Tolnay et al. (1996) in their study of the impact of lynching events in southern counties of the US on subsequent events in neighbouring counties).

Event history analysis is an umbrella term for a set of procedures that analyse time-dependent processes. It is prominent in the field of international relations, where it has been used to examine the development of international conflicts. Regression models estimate the 'risk' of experiencing an event at a certain point in time, based on a set of covariates, with the assumption that both timing and spacing of observations become critical variables in their own right. The application of event history analysis to the modelling of diffusion is demonstrated in Soule's (1997) analysis of college anti-apartheid shantytown protests in the 1980s, and in Myers' studies of contagion effects in the racial riots of the 1960s (Myers 1996; 1997). In later work, Myers (2000) looks at characteristics of events (e.g. riots) and location (e.g. the city), and how these affect the contagious potential of the event. He examines the role of the communication system in places that would allow knowledge of events to spread to other places. Event history diffusion models allow four specific types of diffusion related predictors: intrinsic characteristics, infectiousness, susceptibility, and proximity (Strang and Tuma 1993; Strang 1995):

- Intrinsic characteristics are attributes of actors that increase or decrease their propensity to adopt behaviours, and include social characteristics of the population or local economic conditions (Olzak and Shanahan 1996). For example, the degree of ideological radicalisation of an organisation's membership will have an effect on its tendency to engage in a protest.

- Infectiousness involves an estimate of how influential the individual actor's adoption is on others. For example, Strang and Tuma (1993) found the magnitude of protest activity to be a strong indicator affecting further contagion in the analysis of riots. Similarly, the media exposure that the Seattle anti-WTO demonstrations received turned this event into a particularly powerful mobilising factor.

- Susceptibility is how responsive an individual actor is to others' adoption, and is measured using social, political and cultural characteristics. Some conservative religious communities, for example, are often resistant to new ideas and tend to

attempt to isolate themselves from external connections.

- Proximity indicators have to do with the level of influence actors have on each other based on the closeness of their location. Proximity is related to structural attributes of physical distance and centrality (Strang and Tuma 1993; Myers 1996). For example, Minkoff (1997) uses organisational density as a factor affecting the successful diffusion of protest movements.

The diffusion of global protest – The Danish Cartoons Crisis

To illustrate how aspects of diffusion models can be applied to the study of global civil society, we use the protests sparked by the publication of 12 cartoons depicting the prophet Muhammad in a Danish newspaper, *Jyllands-Posten*, on 30 September, 2005. The publication of the controversial cartoons sparked protests not just in the predominantly Muslim countries of the Middle East but in Asia, Latin America, North America, and Europe. Protests occurred for over a year, driven in part by not just the initial publication but by subsequent reprints in other newspapers, news programmes, and television shows. Our rudimentary analysis presented here aims to demonstrate the logic, process, and application of diffusion models for the study of global civil society.

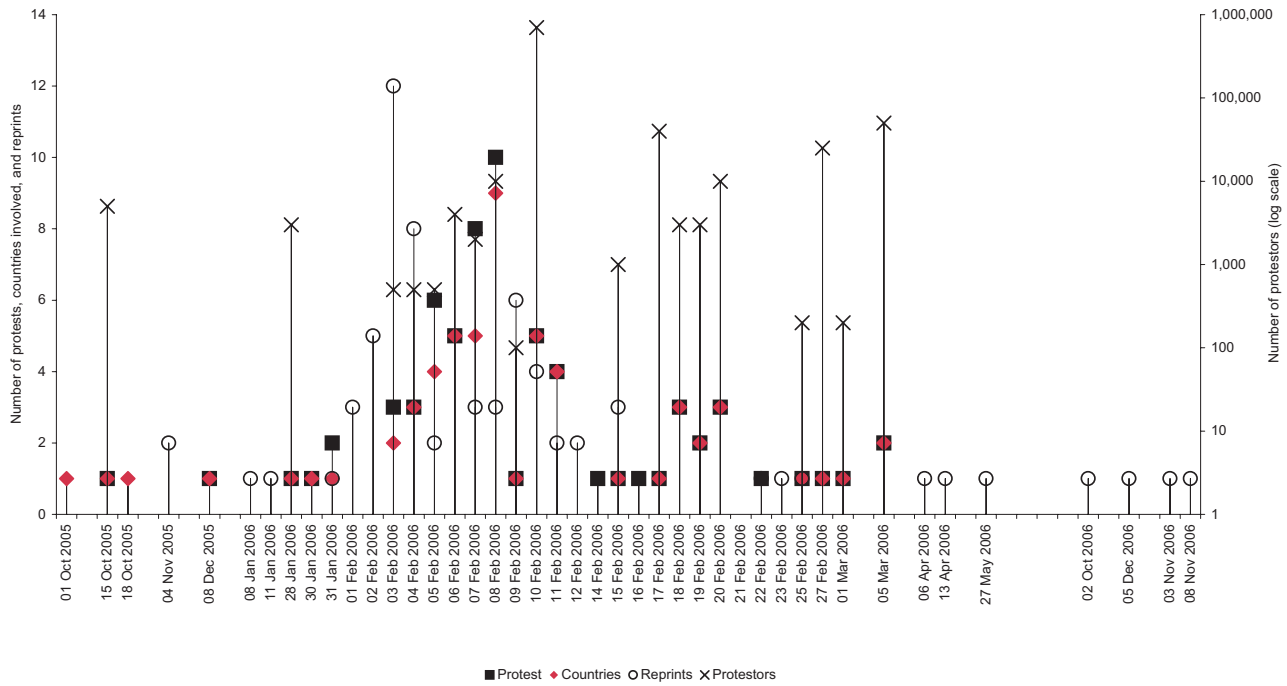
In terms of the diffusion models presented above, the Danish Cartoons Crisis would fit the mixed model, where both external and internal diffusion takes place: external, due to the extensive media attention the crisis received after the initial adoption of the object (i.e. concerns about the Cartoons and willingness to act), with a barrage of newscasts and repeated images on CNN, BBC World, Al-Jazeera, and many other international news services; and internal, because many of the groups participating in the protests were linked either personally or organisationally across locations that spanned large distances. Existing communication networks facilitated the spread of protests.

The first step in building a dataset for diffusion models is to construct a timeline of events with basic descriptive variables such as the date the protest began, the country/locality in which it took place, the number of protestors involved, and the length of the protest. One limitation of this kind of analysis, however, is 'censoring.' Left censoring occurs when we do not have information about the beginning of an event, and right censoring occurs when we do not have information about the end of an event. In terms of the latter, the fact that our cut-off point for reported data was March 2006 means that the levelling-off phenomenon characteristic of the S-shaped curve beyond the inception point is less pronounced (see especially Figure M4). The source for most of this information was gleaned from Wikipedia (URL), which provides a detailed timeline of events, based on media coverage. Thus our data, which is dependent on events reported by the media that were recorded in Wikipedia, may not capture every incident relating to the Cartoons Crisis. It should also be noted that we did not cross-check and validate Wikipedia entries for the purposes of this exercise. Figure M3 shows a timeline of the number of protests, protestors and countries involved in the cartoon controversy, and the number of reprints of the cartoons. The protests peaked in February 2006, and occurred in many countries, including Hong Kong, New Zealand, Belgium, France, the UK and Finland.

Interestingly, no major protests took place in the United States with the exception of two minor protests that occurred on the college campuses of the University of Wisconsin and the University of California, Irvine. Since their initial publication in Denmark in September 2005, the cartoons were reprinted about 70 times in various newspaper and media outlets between October 2005 and February 2007, on average about eight reprints per month. As shown in Figure M3, approximately 75% (53) of these reprints appeared in February 2006, which may account for the large numbers of protests that occurred that month.

In terms of analysis, a second step is to determine the duration of time between events, in this case, protests. This time interval or period is called a 'spell' or diffusion period. In the public health field, if researchers are interested in death from AIDS, the spell may be the time between contraction of HIV and death from AIDS, and typically is measured in years. For shorter events, such as when radio stations first play a particular song, or when a video was first posted on the Internet, the spell may be measured in weeks, days, even hours. Given that this dataset concerns protests, which are normally thought of as daily occurrences, spells will be measured in days.

Figure M3 Timeline of number of protests, protestors, countries involved, and cartoon reprints



Source: Wikipedia, http://en.wikipedia.org/wiki/Timeline_of_the_Jyllands-Posten_Muhammad_cartoons_controversy

Specifically, there were 15 distinct spells and 31 events (see Table M1).

We apply event history analysis to model the diffusion of the protests listed above. We determine the risk set and the hazard rate similar to how we defined diffusion rates and potential adaptors in the external-influence model. The risk set is defined as, 'the set of individuals (or any subject of interest) who are at risk of event occurrence at each point in (discrete) time.' (Allison 1984: 16) The 'event' of interest or the adoption of the object of diffusion is the date when a protest first occurs. Note that only the date of the first protest in a given country is recorded, subsequent protests in the same country are not included in this analysis because the country is no longer at risk. For example, numerous protests occurred in Denmark after the initial one in October 2005, but only the date of the first protest is included in this analysis.

In this case, therefore, the risk set is the set of countries at potential risk of experiencing a protest - or the 208 member states of the UN. It is debatable whether all UN member countries are at risk of a protest, and there is an argument that the risk set should be limited to countries where protest is politically feasible (that is, excluding Communist or other illiberal regimes where the act of protest may be circumscribed), or to countries with a large Muslim population. However, many countries in the major regions of the world did in fact experience protests; therefore, it is an appropriate assumption that all countries are at risk.

The hazard rate, in analogy to the diffusion rate, is defined as the probability that an event will occur during a particular period to a particular individual in the risk set (Allison 1984: 16). The hazard rate in the Danish Cartoons crisis is the ratio of the percentage of countries that have experienced a protest divided by the percentage of countries that have not experienced a protest (or those at risk). Table M1 lists the hazard rates along with the spell dates, cumulative percentages, and percentage of those at risk. Figure M4 shows a graphical representation of the cumulative adoptions, or countries experiencing protests.

Of particular interest is the question of what factors help predict the occurrence of protest events at the country level. Before we can estimate the regression models to do so, we need to create a dichotomous

Table M1 Jyllands-Posten cartoon protests, basic event history data structure

Date of First Protest	Number of Countries	Percentage of total	Cumulative percentage of countries	Percentage at risk (1-cumulative)	Hazard rate = (percentage of total / percentage at risk)
14 Oct 2005	1	0.5	0.5	99.5	0.5
7 Dec 2005	1	0.5	1.0	99.0	0.5
27 Jan 2006	1	0.5	1.4	98.6	0.5
2 Feb 2006	1	0.5	1.9	98.1	0.5
3 Feb 2006	2	1.0	2.9	97.1	1.0
4 Feb 2006	1	0.5	3.4	96.6	0.5
5 Feb 2006	4	1.9	5.3	94.7	2.0
6 Feb 2006	3	1.4	6.7	93.3	1.5
7 Feb 2006	5	2.4	9.1	90.9	2.6
8 Feb 2006	1	0.5	9.6	90.4	0.5
9 Feb 2006	3	1.4	11.1	88.9	1.6
11 Feb 2006	3	1.4	12.5	87.5	1.6
14 Feb 2006	1	0.5	13.0	87.0	0.6
17 Feb 2006	3	1.4	14.4	85.6	1.7
19 Feb 2006	1	0.5	14.9	85.1	0.6
Total	31				

dependent variable where 0 states that no protests took place, and 1 indicates their presence. Since this is a discrete time model,[3] we expand the original dataset in which the unique spell dates are repeated for each event. Recall from Table M1 that there are 15 spells, each corresponding to a unique date. Table A in the appendix shows the original dataset with protests occurring in 31 different countries. The expanded data set is listed alphabetically by country and the dependent variable is labeled 'event.' The date for each spell is repeated for each country, hence 465 observations (31 events multiplied by 15 spells); and for each given 'spell set' per country, recall that it is 15 each, event=1 for the date when the protest occurred in that country, event=0 for dates prior to the protest date, and event=. for dates after the initial protest date. Given this simple data structure, we can conduct logistic regression models with a dichotomous dependent variable.[4] The independent variables used in the regression include:[5]

- Level of economic development (low, middle, or high income countries, using World Bank country classifications based on per-capita income levels) as a control variable
- Percentage of total population that is Muslim, as a measure of the propensity of local protest potential (Wikipedia URL)
- INGO membership density per 1 million people, as an indicator of a country's integration in global civil society (Union of International Associations 2003).

Table M2 shows that, controlling for economy type and INGO membership density, the percentage of the population that is Muslim in a given country is a significant predictor. While this finding may not be surprising, it is interesting to note that the probability is fairly high (66%) regardless of a country's wealth. In fact, an odds ratio of 1.66 would suggest that a one percent increase in the Muslim population increases the likelihood of a protest by 22% (this is determined by calculating the log of the odds ratio result), net of economy type and global civil society integration. In

[3] *There are two time models used in event history analysis, continuous and discrete time models, with different estimation procedures for each. Continuous time models have a data structure in which there are no breaks in time. Discrete time models take into account breaks and temporal discontinuities so that events are discrete in nature and often occur at specific points in time (i.e. a given year, week, or month).*

[4] *We provide here only a brief description of the expanded dataset; interested readers should contact the authors for more information or a copy of the expanded dataset used for analysis.*

[5] *For more details see Table A, available at* www.lse.ac.uk/depts/global/yearbook08data.htm

Figure M4 Cumulative diffusion of protests

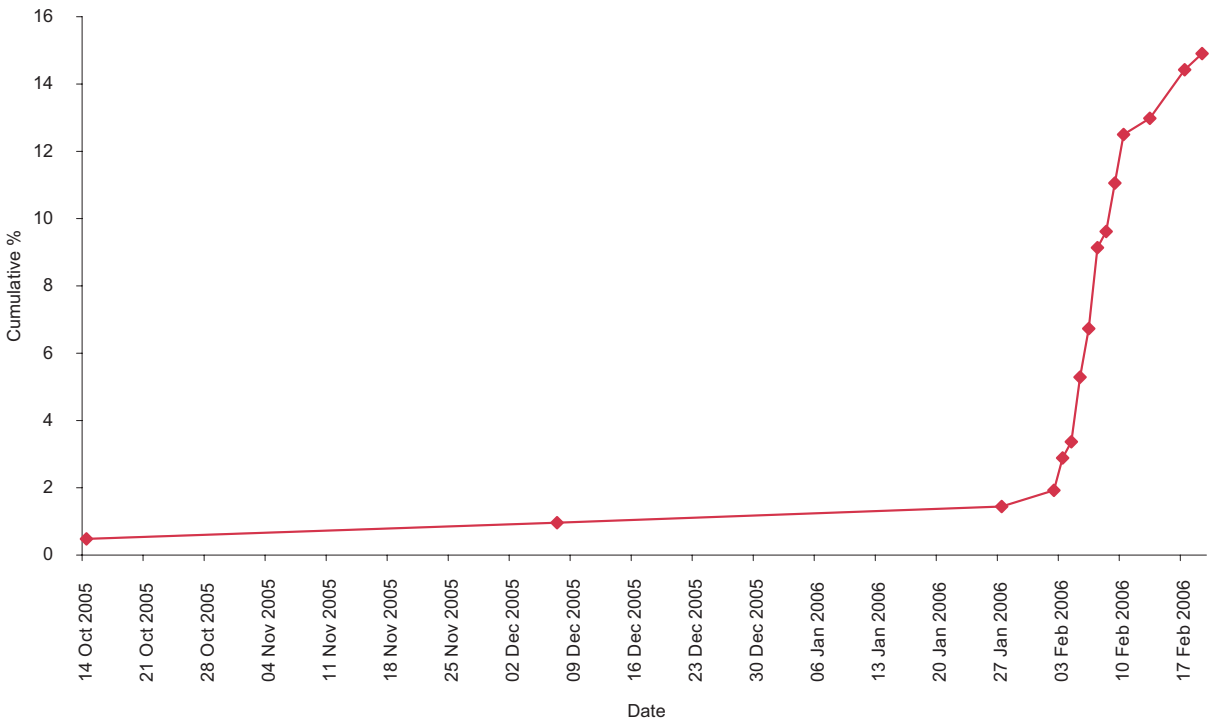


Table M2 Logistic regression model predicting spread of protests (N=269)

Predictors		Coefficient	Standard error	p value	Odds ratio
Economy type:	Low income vs. middle income	-0.083	0.184	0.653	0.921
	Low income vs. high income	0.256	0.273	0.350	1.291
% Muslim		0.508	0.212	0.017	1.663
INGO membership density		0.001	0.001	0.254	1.001
Intercept		-2.403	0.154	0.000	

addition, our measure of global civil society integration is not significant, with about an even probability of a protest occurring, controlling for economy type and percent Muslim. The main diffusion agent may have been the media (external model), combined with efforts by local organisations (internal model), which jointly succeeded in mobilising a highly susceptible population by taking advantage of a very contagious or infectious event.

Using the widespread Danish cartoon protests as an example, we wanted to show what a diffusion analysis can achieve and what it looks like. This technique can be applied to other global civil society phenomena such as the spread of social forums. In addition, the model presented in Table M2 can be expanded to include other predictors and control variables such as the number of civil society organisations in a given country or the density of international links between Muslim organisations, the number of media outlets that reprinted the cartoons in a given country and the rate of exposure to Arab media such as Al-Jazeera, regime types, and even a spatial measure of proximity to countries where protests already took place.

Conclusion

We agree with Levi-Faur (2005) that a diffusion perspective is important in globalisation research: whereas until recently social scientists were predominantly interested in explaining stability and exploring the variegated factors that contributed to the stability of the post-war order, since the late 1980s, and with the end of the Cold War, the focus has shifted to change, transformation, convergence as well as divergence. The analysis of structures, he adds, may capture some of the dynamics of these changes; yet structures typically cannot capture the socially and politically contested nature of change and the complex processes involved. In particular, a structural view often falls short in analysing how actors involved in the process of change imbue it with meaning, interpret and project it.

The growth and expansion of communication and transport technologies make it likely that interdependencies of events will become increasingly important drivers of change. Consequently, global networks become denser and wider in scope, and accordingly, diffusion processes can be expected to become more important. Thus, diffusion perspectives allows us 'to endogenize change, to see it in a social and network context and, most important, to look at the role of "knowledge actors" in its diffusion' (Levi-Faur 2005: 21). Likewise, Tarrow (2001) pleads for greater recognition of the mechanisms of diffusion that help create and change the structural aspects of globalisation. This Chapter, its brevity notwithstanding, takes a step towards this goal by suggesting the use of diffusion models as readily available options to scholars and students of globalisation generally and global civil society in particular. Diffusion models help uncover and understand the complex and often perplexing nature of a globalising world.

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