Abstract

In modern states, mobilization policy has been used to awaken people to new ideas such as national identity, industrial capitalism, and civic society. However, it has long been debated whether mobilization in new countries or in countries under reconstruction creates an integrated identity or results in fragmentation of various ethnic groups. Although the idea that identity is not immutable but malleable is now widely accepted in political science, sociology, and other social sciences, the degree to which identity can be reconstructed once it has been mobilized remains unclear. This study employs an agent-based model to address questions regarding the relationship between governments’ mobilization and the integration of identity in countries. The analysis suggests that more rapid mobilization by governments stabilizes a greater ethnic cleavage. This result is found to be robust by changing parameters and by modifying the specifications of the model. In addition, the analysis presents two other implications. The first is that a spiraling fragmentation of identity might occur if governments fail to accommodate people. The second is that in an age of advanced communication, governments need more assimilative power than before in order to secure integration. The analysis suggests that future research about identity formation in countries should consider the rigidity as well as the flexibility of identity.

Keywords:
Mobilization, Identity, Nation, Ethnicity, Culture, Agent-Based Modeling

Introduction

1.1 Does mobilization by governments bring people together into an integrated identity, or does it cause fragmentation of various groups? Although many recent studies have supported the flexibility of identity, the question that still remains is to what extent identity is malleable once it is mobilized. This article investigates these questions.

1.2 People’s identification with a group is not obvious. A person who speaks a language used in her/his region but who does not know that a number of languages exist worldwide is not aware that she/he belongs to a specific language group that can be demarcated from other groups. Similarly, a person who lives in a sovereign state but only knows her/his neighborhood does not consider that she/he is a member of that state.[1] In other words, group identification emerges only after people realize how they are situated in their broader social and physical environment. Activities that lead people to realize these settings are called mobilization. Mobilization informs people of their surroundings in a wider context and allows them to understand their similarities and differences with others. Therefore, mobilization constitutes a key mechanism by which group identity is formed among people. In modern times, the major mobilizer has been sovereign states. In order to create a single and loyal identity, states have implemented various mobilization policies. Mobilization policies (e.g., school systems, publishing papers in an official language, and migration that forces farmers to become urban workers) have led people to recognize who they are in terms of points such as language, religion, custom, history, and expectations. Thus, determining the effects of mobilization by governments is essential to the study of identity formation that evolves at the level of a sovereign state.[2]

1.3 In studies that investigate the effectiveness of government mobilization on identity formation, the main parameter of interest is the pace (or rate) of mobilization. The effectiveness of rapid mobilization has long been debated. In the second half of the 20th century, political development theorists and their critics debated whether rapid mobilization is able to bring about an integrated identity or results in ethnic cleavage (Huntington 1965, 1968; Connor 1972; see also Hagopian 2000; Berger 2003; Yamamoto 2008). Despite this debate, the relationship between the pace of mobilization and success in the integration of identity remains
This study comprises seven parts. Following this introductory section (Section 1), Section 2 reviews the previous literature. Section 3 develops an agent-based model that analyzes the effects of mobilization on identity formation. Section 4 examines the sensitivity of the model by altering parameters. Section 5 presents the results of the analysis, revealing that more rapid mobilization stabilizes a greater cleavage of identity and that this result is robust despite the assumption of identity malleability that is included in the model. Sections 6 and 7 discuss the results and draw policy implications.

### Previous Research

2.1 This article investigates groups termed nations or ethnicities. There are two types of arguments about the nature of these groups.

2.2 On one hand, researchers consider that these groups are fixed or far less malleable. For these researchers, the intentional formation of identity groups is difficult. As a result, the only solution for rivalries between ethnic groups living in the same state is not to realize an integrated nationhood but to create a cooperative relationship between these groups. For example, Liphart (1977) and Horowitz ([1985] 2000) investigate the mechanism of power sharing between ethnic groups and analyze the effectiveness of that mechanism on the stability of the state and the society. Easterly and Levine (1997), Miguel (2004), and Miguel and Gugerty (2005) analyze the effects of ethnic diversity and/or cooperative ethnic relations on the performance of public policies in a state. Moreover, formal analysts similarly address this issue. Assuming the differences in ethnic preference, Fearon and Laitin (1996) investigate conditions that facilitate interethnic cooperation. Alesina and Spolaore (2003) analyze mechanisms in which state borders are determined on the basis of fixed ethnic preferences. More recently, multiculturalism, which emphasizes cultural diversity in a state, assumes this perspective implicitly (see Rodríguez-García 2010 for the debate on multiculturalism and assimilation). In addition to studies that investigate the immigration policy of European countries (e.g., Heath & Demireva 2014), interethnic cooperation policy in multi-ethnic developing countries, such as Singapore, are studied from this perspective (e.g., Wong 2014). In nationalism theory, this perspective is supported by primordialism (essentialism or historicism), which argues that identity groups in the present day trace back to the era before the modern times and emphasizes that objective and enduring bonds of culture, which are embedded in tradition, history, and mythology, constitute persistent group identity (e.g., Smith 1986; Armstrong 1982).

2.3 Other researchers consider that identity is more flexible. Political development theorists in the 1950s and 1960s argued that an integrated nation can be created by implementing mobilization policy in new Asian and African countries (e.g., Kahin 1952; Lerner 1958; Rostow 1960; Almond & Coleman 1960; Pye 1962). Yamamoto (2007) develops a differential equations model that evaluates national integration policies in the Philippines and argues that the assumption of flexible identity is more realistic (see also Deutsch [1953] 1966, pp. 235–239). Constructivist approaches in international relations studies emphasize the flexible nature of identity. As Rousseau and van der Veen (2005, pp. 688–689) summarize, one of the core elements of constructivism is that individuals potentially possess multiple identities and change their activated identity depending on their social interactions. In addition, in contrast with multiculturalist approaches, assimilationism assumes identity flexibility. For example, Edgar (2014) reveals that increased adjustment to Australian life (i.e., assimilation) leads to more residential dispersion of people (i.e., integration), although Bar-Gill and Fershtman’s (2014) study of population dynamics demonstrates that assimilation policy has an inverse effect and increases rather than decreases the size of minority groups. In nationalism theory, modernism supports this perspective, insisting that nations are entities that have been created anew in the modern era through mobilization and stressing the subjective and changeable nature of these groups, such as imagined communities (e.g. Anderson [1983] 1991; Gellner 1983; Hobsbawm 1990; Hobsbawm & Ranger 1983).

2.4 The reality regarding human identity is that it is both persistent and changeable. Theorists of nationalism on both sides admit that the nature of identity group should not be regarded as exclusively attributable to either one of these characteristics. Smith (1986, pp. 29–30), a leading advocate of historicism, indicates the importance of subjective and changeable elements such as “a sense of solidarity” in ethnies, which he considers to be the pre-modern prototype of modern identity groups. Meanwhile, Gellner (1983, pp. 53–56), a major proponent of modernism, argues that both subjectivity and cultural bases are necessary in order to define the concept of nation in the modern age. Therefore, rather than assuming either one of these characteristics, developing a model that includes identity that is articulated subjectively as well as cultural basis that binds that articulation is an appropriate approach. The situation analyzed is one in which people who possess these types of internal properties interact with one another, and their attributes evolve through such interactions.

2.5 In this respect, agent-based modeling is superior to other approaches because it is able to formulate agents’ internal properties (e.g., identity and culture) as strings and because it specifies the mechanism by which the states of these attributes are contingently changed through interaction between agents. As Yamamoto (2008) describes, although three types of approaches (i.e., qualitative, statistical, and mathematical) have been employed in studies of national/ethnic identity, these approaches have failed to analyze the mechanism of identity formation directly. Historical documents in qualitative approaches are insufficient to detail this mechanism. Statistics only describes populations of groups that are typically categorized by criteria such as language and religion and have no information about the mechanism of identity formation. Moreover, traditional mathematical approaches...
such as game theory and differential equations models fail to analyze dynamic interactions with which people change their internal properties. Internal attributes, such as preferences and identity, are fixed in the analysis of game theory. Meanwhile, differential equations models focus on the dynamics of aggregate variables (e.g., changes in the population of each group) rather than analyzing dynamics at the micro level (e.g., internal states of people). Thus, agent-based modeling is the only approach that allows us to analyze the mechanism of identity formation directly.

2.6 The agent-based approach to culture and identity were initiated by Axelrod (1997) and Epstein and Axtell (1996). The research that follows their studies can be categorized into four types. First, Castelletano et al. (2000) and Klemm et al. (2003a, 2003c, 2005) examine the robustness of Axelrod's analysis by modifying the original model, changing parameters and dimensions, and adding noise. Their studies reveal that order–disorder transitions (i.e., transitions from homogeneous to fragmented configurations) occur in the system. Second, Shibani et al. (2001), Leydesdorff (2001), Greig (2002), Gatherer (2002), Parisi et al. (2003), and González-Avella et al. (2007) focus on social contexts more closely. They investigate how settings that are more realistic than those assumed by Axelrod – such as the existence of global information, new technologies, the expansion of communications, mutations, geography, and mass media – lead to new configurations. Third, Kennedy (1998) reinterprets Axelrod's model as a system of optimizing cognition and discusses this model in terms of social psychology. Finally, political scientists analyze various political problems, such as ethnic conflict, the effect of repression and power-sharing on secessionism, civic communities, and the formation of shared identity (e.g., Cederman 1997, chapter 7; 2001; Lustick et al. 2004; Rousseau & van der Veen 2005; Yamamoto 2008; see also Bhavnani & Backer 2000; Bhavnani 2003, 2006; Hammond & Axelrod 2006).

2.7 Among these agent-based models, Rousseau and van der Veen (2005) and Yamamoto (2008), who investigate the formation of shared identity, are most relevant to this paper. However, the former focuses on factors such as the role of leaders for forming identity and does not address mobilization itself. The latter is the only agent-based model that studies the relationship between mobilization and identity formation, but that study is insufficient in three respects. First, Yamamoto (2008) adopts the artificial-society approach developed by Epstein and Axtell (1996). This approach intends to develop models that are closer to the real world by including elements in a comprehensive manner. Yamamoto (2008) implements a variety of elements that affect national and ethnic identity formation, such as bureaucrats, publications, dominant groups, colony borders, different natures of ethnicity, various causes of ethnonationalism, and multiculturalism. As a result, a number of factors influence the course of identity formation, and the model's robustness is ambiguous. In contrast, this study reduces the number of parameters and develops a model that focuses on how mobilization affects the formation of identity. By doing so, a clearer relationship between mobilization and identity formation is presented. Second, Yamamoto (2008) focuses on local interactions and does not consider the effects of long-distance communication that characterizes the contemporary world. In contrast, this study investigates these effects and presents implications that are more relevant to today. Finally, although Yamamoto (2008) considers ethnonationalism, that study is interested in finding the root cause of this phenomenon. Consequently, it does not address the relationship between mobilization and ethnonationalism. Unlike that study, the current one investigates that relationship by including ethnonationalism modeled using a method that is simpler than that of Yamamoto (2008).

The Model

3.1 Based on the argument in the previous section, identity is formalized using both cultural and subjective factors.[6] First, as in many other models, the cultural aspect of identity is formalized as in Axelrod's model (Axelrod 1997, p. 154). Specifically, culture comprises a set of features or a vector of F components (σ1, ... , σF). Each value of σi is defined by traits, which comprise integer values of 0 ≤ q < Q. Each σi takes any one value from 0, ..., Q − 1. Thus, culture can be described as (10:8:21) or (5:35:0:2:17:0:20:11), according to the range of F and Q, respectively. In the social context, each feature implies items such as language, religion, and eating customs. In the case of eating customs, each trait implies, for example, different staple diets such as bread and rice. Second, the subjective aspect of identity is formalized in a manner such that although individuals can imagine their own identities, these identities cannot be embraced with absolute indifference to their culture. To illustrate, if culture is {σ1, σ2, σ3, σ4}, identity might be, for example, {σ1,k, σ2,l, σ3,m, σ4,n} = (5:35:0:17:11) and P = 3, identity might be, for example, {σ1,k, σ2,l, σ3,m, σ4,n} = (5:35:0:17:11) and P = 3, identity might be, for example, {σ1,k, σ2,l, σ3,m, σ4,n} = (5:35:0:17:11).

3.2 This formulation implies that even if two individuals possess the same culture ((5:35:0:17:11), they might have different identities ((5:#:0:17:1) and (#:#:0:17:11)). In other words, individuals who share a common cultural background can imagine identities different from each other. Nonetheless, individuals can never imagine their identities as being completely free from their cultural background. The essence of this two-layered formulation is shared by various agent-based analyses that implement national/ethnic identity (e.g., Epstein & Axtell 1996; Cederman 1997, chapter 7; Lustick et al. 2004; Rousseau & van der Veen 2005; Yamamoto 2008). Therefore, this model is cognate by the lineage of these studies, although each model differs in the details.[7]

3.3 The model is defined by N-sites (or agents) that are located on a square lattice as is typical in many agent-based models. This N-sites system can be regarded as a state, particularly a new one or one under reconstruction where the government is pursuing an integrated identity among people as a nation. Sites in the system imply local communities. Each site i possesses a culture comprising F components (σ1, ..., σF), and each σi holds a value from traits (0 ≤ q < Q) as previously described. Initially, each value of σi is assigned from traits with equal probability 1/Q. In addition, site i exists in a binary state of "mobilized" (bi) or
4.2 As in many agent-based models, this model comprises time-discrete dynamics. Each time step is organized from three phases. First, site $i$ is randomly chosen. If $i$ remains underlying, it is mobilized with probability $m (0.0 \leq m \leq 1.0)$; if $m = 1.0$, $i$ is always mobilized; if $m = 0.0$, $i$ is never mobilized. Once $i$ is mobilized, it activates an identity that comprises $P$ components. $P$s are randomly chosen from its culture comprising $F$ features. If a chosen $P$ has already been mobilized and therefore has already activated its identity, this process is omitted and we proceed to the second phase. Parameter $m$ implies the power of a government to mobilize through, for example, education and mass media. Higher values of $m$ imply more rapid mobilization, and the value of $m$ is exogenously controlled in the model. In doing so, the model examines how the intensity of mobilization affects identity formation.

3.5 Second, after the first phase, cultural assimilation occurs. Specifically, site $i$ is randomly chosen from the geographically neighbors of site $i$. Each cultural feature $\sigma_i$ of site $i$ except the ones that constitute identity is assimilated to $\sigma_j$ with probability $a (0.0 \leq a \leq 1.0)$. For example, if site $i$ has culture $\{10:5:20:11:7\}$ and identity $\{10:20:11:7\}$, all sites $\{:-5:11:17\}$ can be assimilated with probability $a$. This formulation implies that people have a strong attachment to mobilized or activated identities, such as nationalism and ethnonationalism, and that elements that constitute this identity are difficult to assimilate by others.

3.6 While people may adhere to their mobilized identity, they occasionally change their identity depending on their interaction with other people, as emphasized by constructivist theory. The third phase in the model formulates this aspect. After the process of assimilation, sites $i$ and $j$ enter into the process of identity dissemination if they have both already been mobilized and possess an activated identity. Specifically, if the culture of $i$ is consistent with the identity of $j$, the identity of $j$ is disseminated to that of $i$ and the latter’s identity changes to that of $j$. To illustrate, if $i$ has culture $\{10:5:20:11:7\}$ and identity $\{10:20:11:7\}$ and $j$ has culture $\{21:1:15:11:7\}$ and identity $\{\#:\#:11:7\}$, $j$ changes its identity to $\{\#:\#:11:7\}$ in this process, because the culture of $i$ is consistent with the identity of $j$. On the other hand, if the identity of $i$ is $\{21:1:15:11:7\}$, there is no dissemination because the culture of $i$ is not consistent with the identity of $j$. This process formulates the reality that while people’s identity may change through interaction with others, this transmission of identity is possible only when symbols that constitute identity are, at least potentially, shared among people and justified in terms of their cultural basis. Even if political entrepreneurs attempt to hold up a symbol such as a specific religion and language and seek to manipulate people’s identity, it is impossible to win people’s sympathy if the symbol lacks the authenticity that convinces people that they are of the same lineage.

3.7 In sum, the agent behavior at each time step can be formally described as follows:

1. Mobilization
   (a) Select site $i$ at random.
   (b) If $i$ is not mobilized ($b_i$), mobilize $i$ with a probability $m (0.0 \leq m \leq 1.0)$. If mobilized at this time step, $P (P \leq F)$ features are randomly chosen and the selected features comprise activated identity $A_i = \{c_{ij} \ldots c_{ik}\}$.

2. Cultural assimilation
   (a) Select the nearest (with a Moore neighborhood of range 1) neighbor site $j$ at random.
   (b) For a bond $ij$, set each $\sigma_j \rightarrow \sigma'_j = \sigma_j$ with probability $a (0.0 \leq a \leq 1.0)$ if $\sigma_j \neq \sigma'_k \forall j$.

3. Identity dissemination
   (a) If both $i$ and $j$ are mobilized, calculate the consistency $c_{ij}$ (i.e., the total number of $l$s features that are equal to $j$s features constituting $j$s identity): $c_{ij} = \sum_{l=0}^{s} \sigma_l = \sum_{l=0}^{s} \sigma_l$.
   (b) If consistent (i.e., if $c_{ij} = P_i$), $i$ changes its identity; then, set $A_i \rightarrow A'_i = A_j$.

Base Run

4.1 The model includes six parameters: features ($F$), features comprising identity ($P$), traits ($Q$), the size of the system (i.e., the number of sites; $N$), the assimilation rate ($a$), and the mobilization rate ($m$). Of these, $a$ and $m$ are parameters that represent policy implemented by a government, and the analysis in the next section controls these two parameters. In particular, the analysis focuses on how $m$ affects the convergence, or fragmentation, of identity. Before analysis, this section examines how other parameters ($F$, $P$, $Q$, and $N$) influence the dynamics of the model.

Features ($F$ and $P$)

4.2 Figure 1 illustrates the results of identity formation in a system when the values of $F$ and $P$ are changed (see Appendix for the length of the time steps of each run).
4.3 Figure 1 indicates two characteristics of the system. First, we can find the transition from ordered to disordered systems depending on the changes in $P$. While a small value of $P$ integrates sites into a few identities, a large value precipitates completely fragmented identities (because $N = 100$ in the runs, the number of activated identities ($I = 100$ indicates that all sites enhance identities that are different from each other). We can roughly identify three distinguishable states of identity in the model: ordered, disordered, and intermediate systems. Second, despite this variety, all systems display a similar S-curve transition regardless of the changes in $F$ ($10 \leq F \leq 50$). Although the curves tend to be steeper with a reduction in the value of $F$, no significant qualitative change can be detected in these runs.\(^{10}\)

**Traits ($Q$)**

4.4 Figure 2 indicates the results of changing the values of traits ($Q$). Based on the results of the above runs, three different systems (ordered ($P = 5$), intermediate ($P = 10$), and disordered ($P = 15$)) are examined.

4.5 The results indicate that the number of activated identities ($I$) in each of the three different systems is stable (i.e. $I = 88$ ($P = 15$), $34$ ($P = 10$), and $2$ ($P = 5$)), with the exception of the runs in which $Q$ is set to less than approximately 10 traits. Because the very small value of traits extremely limits the scope of possible cultures and identities that sites can possess, a steep decrease in $I$ near $Q = 1$ is a natural consequence that is embedded in the model.\(^{11}\) In the social context, however, it is plausible to assume that each dimension of culture (features) contains numerous components (traits) and is not confined to a few traits such as $Q = 1$. 

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**Figure 1. Effects of the Values of $F$ and $P$ on Identity Formation**

NOTE: $F$ changes from 10 to 50 at intervals of 10, and $P$ changes from 1 to $F$ at intervals of 1. The remaining parameters are as follows: $Q = 25$, $N = 100$, $a = 0.1$, and $m = 0.001$. Time step = 3.0E + 06. Fifty runs are collected for each parameter setting.

**Figure 2. Effects of the Value of $Q$ on Identity Formation**

NOTE: $Q$ changes from 1 to 100. The remaining parameters are as follows: $F = 30$, $N = 100$, $a = 0.1$, and $m = 0.001$. Time step = 3.0E + 06. Fifty runs are collected for each parameter setting.
2, or 5 (e.g., consider the number of languages or religions that exist in the world).

**Size (N)**

4.6 Third, the size of the system (i.e., the number of sites) for the three different systems \(P = 5, 10, \text{ and } 15\), respectively) changes.

![Figure 3](http://jasss.soc.surrey.ac.uk/18/2/8.html)

**Figure 3.** Effect of System Size (\(N\)) on Identity Formation. Note: Three different sizes \((N = 100, 400, 900)\) are examined. The remaining parameters are as follows: \(F = 30, Q = 25, a = 0.1, \) and \(m = 0.001\). Time step = \(3.0E + 06 \) \((N = 100)\), \(2.5E + 07 \) \((N = 400)\), and \(1.0E + 08 \) \((N = 900)\). Because a larger system needs more time to stabilize, the time steps of larger systems are set longer. Fifty runs are collected for each parameter setting. Although the differences in the results of \(P = 5\) may be indiscernible, their values are 1.56 \((N = 100)\), 4.14 \((N = 400)\), and 6.50 \((N = 900)\).

4.7 Figure 3 seems to indicate that a larger \(N\) causes a larger number of \(I\) in all three systems. However, parameters \(N\) and \(I\) are clearly correlated, and the inset of the figure clarifies this by collapsing \(N\) and \(I\) onto \(I/N\). The \(P\) vs. \(I/N\) graph of the inset indicates that the size of the system does not affect \(I\) significantly and no transition occurs that depends on that size.

### Analysis

**Model 1**

5.1 Thus far, we have identified four characteristics of the model: (1) the transition from an order system to a disorder one by changing the value of \(P\); (2) no qualitative differences depending on \(F\) can be detected; (3) no qualitative changes depending on \(Q\) can be found in the realistic settings (i.e., with sufficiently large values of \(Q\)); and (4) no qualitative differences depending on \(N\) can be found. Based on these results, three different systems in terms of the order/disorder criterion (ordered \((P = 5)\), intermediate \((P = 10)\), and disordered \((P = 15)\)) are examined while \(F, Q\), and \(N\) are fixed. As mentioned earlier, \(m\) is a key parameter for analyzing the effects of mobilization on identity formation.

<table>
<thead>
<tr>
<th>Rate of Assimilation</th>
<th>Type of System</th>
<th>Rate of Mobilization</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a = 0.001)</td>
<td>(P = 5)</td>
<td>(m = 0.001)</td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>98.98</td>
</tr>
<tr>
<td></td>
<td>15</td>
<td>100</td>
</tr>
<tr>
<td>(a = 0.01)</td>
<td>(P = 5)</td>
<td>5.08</td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>75.82</td>
</tr>
<tr>
<td></td>
<td>15</td>
<td>98.14</td>
</tr>
<tr>
<td>(a = 0.1)</td>
<td>(P = 5^*)</td>
<td>1.7</td>
</tr>
<tr>
<td></td>
<td>10^*</td>
<td>32.34</td>
</tr>
<tr>
<td></td>
<td>15</td>
<td>88.22</td>
</tr>
<tr>
<td>(a = 1.0)</td>
<td>(P = 5^*)</td>
<td>1.5</td>
</tr>
</tbody>
</table>

http://jasss.soc.surrey.ac.uk/18/2/8.html
5.2 Table 1 shows the results, from which three points are made. First, given the rate of assimilation and the type of system, a higher mobilization rate generates greater (or at least equal) identity cleavage in all 12 variants. This tendency can be observed at the results of \((a, P) = (0.1, 5), (0.1, 10), (1.0, 5), (1.0, 10), \) and \((1.0, 15)\) clearly. In addition, the statistical results of \((a, P) = (0.001, 10), (0.001, 15), (0.01, 10), (0.01, 15), \) and \((0.1, 15)\) in Table 1 become insignificant, because the number of identities has reached (or nearly reached) maximum (i.e., 100) before the runs of the highest mobilization rate \(m = 1.0\) occur. The differentiation effect created by intensifying mobilization before reaching (or nearly reaching) 100 identities can be detected in these results as well. Moreover, while the remaining two results \((a, P) = (0.001, 5)\) and \((0.01, 5)\) are not significant, both results show that the pairwise comparisons, with the exception of \((m_h, m_h) = (0.01, 0.1)\) and \((0.1, 1.0)\), are significant (i.e., \((0.001, 0.01), (0.001, 0.1), (0.001, 1.0), \) and \((0.01, 1.0)\) are significant). Therefore, we are able to discern from these results that higher mobilization tends to cause greater cleavage.

5.3 This model includes the process of identity dissemination, in which sites change their identity through interaction with others and may subsequently converge into a smaller number of identity groups even after they have been awakened to diverse identities at first. Therefore, this result indicates that once mobilized rapidly, it is difficult for the system to reach the same level of identity integration achievable through slower mobilization. With regard to the debate on mobilization policy, this result appears to corroborate the argument that rapid mobilization causes more ethnic cleavage despite the expectations of policymakers who implement this policy.

5.4 However, we should also note the other results of the analysis. Under the second point, assimilation also affects the integration of identity. As Table 1 shows, given the type of system and the rate of mobilization, a higher rate of assimilation tends to generate a smaller number of identities. Therefore, if policymakers are able to increase the rate of assimilation, such assimilation would outpace mobilization and a more unified identity is possible. Finally, \(P\) affects the results. Given the rates of assimilation and mobilization, a smaller value of \(P\) tends to create a more integrated identity. These three points are all further discussed in the sixth section.

Model 2: noise or defiance

5.5 As described earlier, Axelrod's model has been scrutinized by researchers to confirm whether the results that Axelrod arrived at are robust regardless of the model modification. Models 2 and 3 investigate how model modifications affect the results in this study.

5.6 The prominent aspects that characterize identity formation in the contemporary world are (a) ethnonationalism that proliferates inside a state and defies integration by a government, and (b) long-distance communication that is made possible by the development of technology, which allows people to form an identity beyond local communication with their neighbors. Previous studies have conducted two modifications in this regard. The first is the introduction of noise or mutations (Klemm et al. 2003c, 2005; Parisi 2003), and the second is non-geographical interaction between sites (Shibanai et al. 2001; Klemm et al. 2003b). Model 2 examines the effect of noise, and Model 3 investigates the effect of non-geographical interaction.

5.7 Noise or mutation implies a sudden change in the sites' identity. In the present model, this change can be interpreted as a sudden defiance by a site. Although the literature on ethnonationalism argues various causes of this alienation of people such as economic suppression and the demonstration effect of ethnonationalism (e.g., Hechter [1975] 1999; Nairn [1977] 2003; Connor 1977), this model assumes these factors as given and focuses on how sudden identity change of a local site affects identity integration once it occurs. Model 2 includes noise that occurs at specified intervals. For example, if the interval is set to 100,000, a site is randomly chosen every 100,000th step, its culture is randomly reshuffled, and its identity is randomly reassigned so that it is consistent with its new cultural features. Figure 4 shows the results of changing the length of the intervals from 1.0E + 04 to 1.0E + 06.

<table>
<thead>
<tr>
<th>(m_h)</th>
<th>(m_h)</th>
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<tbody>
<tr>
<td>10**</td>
<td>4.34</td>
<td>14.48</td>
<td>32.4</td>
</tr>
<tr>
<td>15**</td>
<td>14.32</td>
<td>23.38</td>
<td>37.6</td>
</tr>
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</table>

NOTE: \(F = 30, Q = 25, N = 100,\) and time step = 3.0E + 06. Fifty runs are collected for each parameter setting. The numbers in the table are the mean activated identities. ** indicates that all pairwise comparisons, that is, \((m_h, m_h) = (0.001, 0.01), (0.001, 0.1), (0.001, 1.0), (0.01, 0.1), (0.01, 1.0),\) and \((0.1, 1.0),\) are significant at the .01 level tested using the Bonferroni multiple comparison test and at the .00167 (= 0.01/6) level (adjusted by Bonferroni correction) tested using the Mann–Whitney U test.
Figure 4. Effect of Noise on Identity Formation

NOTE: Runs between 1.0E + 04 and 1.0E + 05 are conducted at intervals of 1.0E + 04 steps, and those between 1.0E + 05 and 1.0E + 06 are conducted at intervals of 1.0E + 05 steps (therefore, more dots appear between 1.0E + 04 and 1.0E + 05 i.e., steeper slopes in the graphs). $F = 30$, $Q = 25$, $N = 100$, $a = 1.0$, and time step = 3.0E + 06. $a$ is set to the most assimilative value (i.e., 1.0) in order to clarify the differentiation effect of noise. Fifty runs are collected for each parameter setting.

5.8 First, the tendency that a higher mobilization rate generates a greater identity cleavage is maintained in Model 2. Another important result is that the effect of noise on identity fragmentation is not linear. In the intervals of noise occurrence shorter than 1.0E + 05, more frequent noise rapidly increases the splits in the system (i.e., steeper slopes in the graphs). The implications of these results are discussed in the sixth section.

Model 3: non-geographical interaction

5.9 The simplest and least biased method to introduce non-geographical interaction between sites is random matching. In Model 3, a site that has become active in a time step interacts with another site chosen randomly from the whole system instead of with its geographical neighbor. Table 2 displays the results.

Table 2: Effect of Non-geographical Interaction on Identity Formation

<table>
<thead>
<tr>
<th>Rate of Assimilation</th>
<th>Type of System</th>
<th>Rate of Mobilization</th>
</tr>
</thead>
<tbody>
<tr>
<td>$a = 0.001$</td>
<td>$P = 5$</td>
<td>$m = 0.001$</td>
</tr>
<tr>
<td></td>
<td>$m = 0.01$</td>
<td>$m = 0.1$</td>
</tr>
<tr>
<td></td>
<td>$m = 1.0$</td>
<td></td>
</tr>
<tr>
<td>92.02</td>
<td>96.56</td>
<td>96.72</td>
</tr>
<tr>
<td>(56.84)**</td>
<td>(50.3)**</td>
<td>(48.38)**</td>
</tr>
<tr>
<td>10</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>(1.02)**</td>
<td>(0.06)</td>
<td>(0.04)</td>
</tr>
<tr>
<td>10</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>(0.0)</td>
<td>(0.0)</td>
<td>(0.0)</td>
</tr>
<tr>
<td>15</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>(2.5)**</td>
<td>(9.4)**</td>
<td>(14.4)**</td>
</tr>
<tr>
<td>10</td>
<td>99.9</td>
<td>100</td>
</tr>
<tr>
<td>(24.06)**</td>
<td>(4.04)**</td>
<td>(0.36)**</td>
</tr>
<tr>
<td>15</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>(1.86)**</td>
<td>(0.02)</td>
<td>(0.0)</td>
</tr>
<tr>
<td>10</td>
<td>1.68</td>
<td>9.06</td>
</tr>
<tr>
<td>(−0.02)</td>
<td>(1.86)**</td>
<td>(−2.36)**</td>
</tr>
<tr>
<td>10</td>
<td>34.34</td>
<td>99.34</td>
</tr>
<tr>
<td>(2.0)</td>
<td>(30.6)**</td>
<td>(1.96)**</td>
</tr>
</tbody>
</table>

http://jasss.soc.surrey.ac.uk/18/2/8.html  8  20/10/2015
create. In the real world, a simple indicator such as religion or language was often selected, and such manipulations that entrepreneurs who can manipulate symbols into a smaller value of group boundaries (e.g., violence has emphasized the role of political entrepreneurs who attempt to manipulate ethnic/group symbols and demarcate new models can be interpreted as the number of symbols that represent a particular identity. The literature on ethnic conflict and group that people if they realized that they were being colonized (Anderson 1998, p. 135). Eventually, East Timor received its independence in 2002. In the model, this situation corresponds to the one where an increase in \( m \) accompanies the increase in \( a \), where sites become mobilized before they are fully assimilated. As this case illustrates, although the model implies that the increase in \( a \) can integrate people if \( m \) is kept unchanged, the strategy that promotes assimilation while limiting mobilization is difficult in practical contexts. Assimilation policies available to governments usually entail some elements of mobilization. The case of East Timor illustrates that \( m \) is likely to outpace \( a \). Another condition that is favorable to integration is a smaller number of features comprising identity, \( P \). The value of \( P \) in this model can be interpreted as the number of symbols that represent a particular identity. The literature on ethnic conflict and group violence has emphasized the role of political entrepreneurs who attempt to manipulate ethnic/group symbols and demarcate new group boundaries (e.g., Tilly 2003). Table 1 indicates that given \( a \) and \( m \), a smaller value of \( P \) leads to fewer groups. This implies that entrepreneurs who can manipulate symbols into a smaller value of \( P \) are able to absorb more people into a new group they create. In the real world, a simple indicator such as religion or language was often selected, and such manipulations were

<table>
<thead>
<tr>
<th></th>
<th>15</th>
<th>98.98</th>
<th>100</th>
<th>100</th>
<th>100</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>( a = 1.0 )</td>
<td>( P = 5 )</td>
<td>( (10.76)* )</td>
<td>( (1.82)* )</td>
<td>( (0.1) )</td>
</tr>
<tr>
<td></td>
<td>( (-0.42)* )</td>
<td>( (-0.9)* )</td>
<td>( (-2.16)* )</td>
<td>( (-4.06)* )</td>
<td></td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>1.84</td>
<td>9.62</td>
<td>28.84</td>
<td>70.16</td>
</tr>
<tr>
<td></td>
<td>( (-2.5)* )</td>
<td>( (-4.86)* )</td>
<td>( (-3.56)* )</td>
<td>( (-26.92)* )</td>
<td></td>
</tr>
<tr>
<td></td>
<td>15</td>
<td>3.78</td>
<td>25.06</td>
<td>42.8</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>( (-10.54)* )</td>
<td>( (1.68) )</td>
<td>( (5.2)* )</td>
<td>( (0.0) )</td>
<td></td>
</tr>
</tbody>
</table>

**Note:** \( F = 30, Q = 25, N = 100 \), and time step = 3.0E + 06. Fifty runs are collected for each parameter setting. The numbers are the mean activated identities. The numbers within parentheses are the mean of Model 3 minus that of Model 1. * denotes significance at the .01 level. The differences between Models 1 and 3 are tested, and the results are confirmed using both the \( t \) test and the Mann–Whitney U test.

5.10 Again, the tendency that more rapid mobilization causes greater cleavage can be found. In addition, the results presented within parentheses are noteworthy. They represent the difference between Models 3 and 1 (i.e., the mean of Model 3 minus that of Model 1). Because Model 3 causes greater fragmentation than Model 1 does if the number within parentheses is positive, Table 2 indicates that Model 3 tends to generate greater cleavage than Model 1 does in lower assimilation rates. On the other hand, the highest assimilation rate (i.e. \( a = 1.0 \)) causes opposite results in most variants. These results are discussed in the next section.

### Discussion

6.1 This study addresses whether mobilization policy creates an integrated identity. The results suggest that for people that are rapidly mobilized, their identity does not converge at levels that would be achieved if slower mobilization were implemented. This implication was arrived at despite incorporating the constructivist argument – that people have multiple identity potentials and change their identity through interaction with other people – in the model. In addition, the analysis confirms this implication to be robust irrespective of different social situations assumed by the models (i.e., Models 2 and 3). This finding is congruent with the conditional argument for constructivism that although identities are socially constructed and are not engrained in our genes, they are, nonetheless, difficult to reconstruct once they have been formed (Van Evera 2001, p. 20).

6.2 However, Model 1 also reveals two other results that are favorable to integration: a higher assimilation rate, \( a \), and a smaller number of features comprising identity, \( P \).

6.3 Regarding the former, the results imply that if a government were able to promote assimilation while preventing people from being mobilized, assimilation policy could lead to integration. However, the problem inherent in this type of implementation is that policies of assimilation and mobilization are difficult to separate from each other. For example, linguistic policy is a typical assimilation policy in which a government attempts to diffuse a national language to people who speak their indigenous languages. However, linguistic policy is required to be implemented through school education, and students are inevitably mobilized in that process.

6.4 The episode of East Timor illustrates this case. The education in East Timor under the Portuguese rule was poor, and 93% of East Timorese were illiterate in 1973 (Schwartz 1999, p.199). Following Portugal’s Carnation Revolution in 1974, Indonesia annexed the region in 1976. In the model, the situation of East Timor in 1976 corresponds to that in which sites that have different cultures are set in the system while not being mobilized. Although Suharto’s government fiercely repressed the region after the annexation, it was also eager to assimilate East Timorese into Indonesians. As Anderson (1998, pp. 134–135) describes, the Suharto regime invested large sums in East Timor in the 1980s and established an elaborate school system that included a university to instill the Indonesian language and loyalty to Jakarta in the populace. In the model, this policy corresponds to the increase in the value of \( a \). However, East Timorese who benefited from this policy had access to the Indonesian intelligentsia and press through the national language they learned. Ironically, instead of being assimilated, they realized that they were being colonized (Anderson 1998, p. 135). Eventually, East Timor received its independence in 2002. In the model, this situation corresponds to the one where an increase in \( m \) accompanies the increase in \( a \), where sites become mobilized before they are fully assimilated. As this case illustrates, although the model implies that the increase in \( a \) can integrate people if \( m \) is kept unchanged, the strategy that promotes assimilation while limiting mobilization is difficult in practical contexts. Assimilation policies available to governments usually entail some elements of mobilization. The case of East Timor illustrates that \( m \) is likely to outpace \( a \).
practiced in the aggravation of civil wars in Yugoslavia and Rwanda. In these cases, however, political entrepreneurs only needed to attract part of the entire population that potentially shares common characteristics, and a single symbol such as religion and language was easy to find. In the model, this situation corresponds to the one in which part of the sites potentially share a common trait in a feature, $\sigma_f$, and the decrease in $P$ leads to a convergence of identity into that symbolized by this trait. However, the same strategy appears to be difficult to adopt by governments attempting to integrate the whole population inside their borders. Postcolonial countries demarcated by arbitrary boundaries contain a number of heterogeneous people, and finding a common symbol is often difficult. For example, the Philippines implemented a national language policy after its independence and designated Filipino, which is largely based on Tagalog, as the official language. However, the country involves more than 100 language groups, and the official language, which is rather artificial, does not function as a symbol that induces the entire population to imagine that they are a nation (Yamamoto 2007). In this case, the government faces the difficulty of choosing appropriate symbols. In the context of the model, the manipulation that decreases $P$'s exogenously given in the analysis. In short, in contrast with political entrepreneurs who exploit dissatisfaction among a small number of people who potentially share common characteristics, governments that pursue the integration of a whole population with diverse backgrounds find it difficult to identify a few symbols that are appropriate for manipulation.

6.6 The results of Model 2 suggest another implication. Figure 4 indicates that narrower intervals in which noise (or defiance) occurs tend to cause a greater cleavage of identities. Although this observation is not counterintuitive in itself, an important finding is that the magnitude of cleavage sharply increases in intervals less than 1.0E + 05. This finding implies that once the number of people who feel alienated and thereby enhance different identities exceeds a specific threshold, a spiral of fragmentation begins to occur, and the reintegration of these people becomes much more difficult. Although there are various factors that cause alienation for people, such as poverty and the diffusion of secessionist ideology, the analysis implies that governments seeking integration need to implement policies that accommodate people (e.g., redistribution of wealth), and prevent them from being alienated seriously.

6.7 Finally, Model 3 indicates implications for the age of rapid technological progress. Model 3 modifies Model 1 by replacing the rule of local interaction between sites with that of random matching. This version approximates communication that allows sites to interact non-geographically, which is promoted by the development of technology in the contemporary world. Table 2 indicates two points. First, Model 3 causes greater cleavage than Model 1 does in the lower assimilation rates. Second, the former model generates smaller cleavage than the latter does in the higher assimilation rates (particularly in $a = 1.0$). These results imply that governments seeking integration in the contemporary world require (and prefer) more assimilative powers than before. More precisely, because the numbers in parentheses in Table 2 are negative in the cases of higher assimilation rates, governments that possess strong assimilative powers are able to promote greater integration than was previously possible. Meanwhile and perhaps more importantly, governments that fail to have high assimilative powers are confronted with a more fragmented reality than that confronting past governments, because the numbers in parentheses are positive when the assimilation rates are lower.

Conclusion

7.1 This study reveals challenges facing governments that seek to construct a unified country by mobilizing its people to an integrated identity. The analysis suggests that rapid mobilization tends to stabilize a fragmentation of different identity groups. Meanwhile, governments might achieve integration if they can promote assimilation while keeping people from becoming mobilized. However, as illustrated by the case of East Timor, assimilation and mobilization are closely related to each other, and it is likely to be difficult for governments to practice this strategy. Moreover, although political entrepreneurs have manipulated symbols of identity and forged new groups, governments seeking an integrated identity in a country find it difficult to choose a few symbols that encompass the whole population. In addition, the analysis suggests that a spiral of alienating people, once it occurs, exponentially exacerbates the fragmentation. Finally, governments in the contemporary world are required to possess more assimilative powers than those in the past. Attempts by postcolonial countries to construct a stable country by creating an integrated identity as a nation have often failed. The same endeavors in countries currently under reconstruction are also confronted by similar difficulties. This study illuminates these realities. Although recent studies have focused on flexibility in identity, future research on this subject should consider the rigidity as well as the malleability of identity.[15]

Notes

1In this paper, "state" is used when formal aspects of this entity, such as sovereignty, legal borders, and administrative apparatus are emphasized. Meanwhile, "country" is used when specific or existing countries, such as the Philippines, ones in the Middle East, and developing countries are emphasized.

2Recently, the term "mobilization" has been used in ways other than this paper's terminology. For example, the United Nations Children's Fund (UNICEF) has proposed mobilization that promotes social development in developing countries. McKee (2000, pp. 108–109) defines this type of social mobilization as "a process of bringing together all feasible and practical inter-sectoral social partners and allies to determine need and raise awareness of, and demand for, a particular development objective. It involves enlisting the participation of such actors, including institutions, groups, networks and communities, in identifying, raising,
and managing human and material resources, thereby increasing and strengthening self-reliance and sustainability of achievements." Meanwhile, the use of mobilization is sometimes confined to political aspects. For example, Vermeersch (2011, p. 1047) defines political mobilization as "the process whereby political actors encourage people to participate in some form of political action. In its concrete manifestations, this process can take on many different shapes. Political mobilizers may typically persuade people to vote, petition, protest, or rally, or to join a political party, trade union, or politically active civic organization.”

The terminology used in this article is more similar to the traditional one defined by Deutsch (1961, [1953] 1966).

3In this article, the term “nation” is defined as a group in which people identify themselves with a sovereign state where they live. Meanwhile, the term “ethnicity” is used as a group in which people identify themselves with a smaller group that exists inside borders of a sovereign state.

4Lijphart (2001, p. 11) “confesses” that he accepted the primordial view of ethnicity before 1980 without giving it much critical thought.

5For formal approaches to nation and ethnicity, see articles referred in the second and third paragraphs in this section.

6The C++ code of the model can be found at http://www.openabm.org/model/4147/version/1/view.

7Because there are many ideas about what elements constitute identity, this study might have adopted other ones. So far, however, no consensus exists on the appropriateness of each idea. At the same time, as described in the text, many agent-based models have adopted ideas similar to those presented in this study. Considering these two points, this article employs an idea that is consistent with the earlier agent-based models and thereby allows comparison between the models.

8The model adopts a Moore neighborhood of range 1. Therefore, site i has a maximum of eight neighbor sites.

9If i has not yet been mobilized, it enhances no identity, and all features of i are assimilated with probability a.

10For a detailed discussion of the transition in Axelrod’s and related models, see Castellano et al. (2000) and Klemm et al. (2003a, 2003b, 2003c, 2005).

11If Q = 1, all sites possess only one type of culture (e.g., (0:0:0) if F = 3 and (0:0:0:0:0:) if F = 5). In these cases, even if they enhance different identities (e.g., (0:0:0:0:0:) and (0:0:0:0:0:) in the case of F = 5), their identities are completely transferable in the process of identity dissemination and soon converge to a few identities.

12The term “statistically insignificant” in the analysis does not mean that there are no significant results in every pairwise comparison, as explained by the note of Table 1. For example, in the case of (a, P) = (0.01, 10), all pairwise comparisons except that between m = 0.1 and m = 1.0 are significant; thus, because of the one insignificant result, ‘**’ is not indicated in (0.01, 10). The one exception exists because the number of identities almost reaches its maximum in m = 0.1, and further intensification of mobilization by setting m = 1.0 brings no greater cleavage. A similar rationale applies to the other cases ((0.001, 10), (0.001, 15), (0.01, 15), and (0.1, 15)). Thus, these cases can also be regarded as exhibiting the differentiation effect of mobilization.

13According to Anderson (1998, p. 134), the number of pupils enrolled was 50 times higher than that in the Portuguese era, and illiteracy decreased from 90% in 1972 to 42% in 1990.

14The interest of both modernism and primordialism in nationalism theory focuses on the nature of group identity, and these theories do not directly address policy issues that are discussed in this section. However, it is likely that modernism potentially considers that assimilation policy can create new identity groups, whereas primordialism holds the opposite view. Because the findings in this paper indicate that given other parameters, the number of groups changes depending on the rate of assimilation, the result supports modernism implicitly.

15Having clarified the conflicting relationship between mobilization and integration, the next issue to be addressed is finding the means to solve this problem. An approach to this issue is to separate from Axelrod’s model. For example, adding policy measures that appear useful for the solution (e.g., redistribution of wealth and power sharing) to the model enables us to investigate how these policies change the relationship between the two variables. However, this type of research requires the model to be reformulated and will be conducted in a follow-on study.

Acknowledgements

The author would like to thank the journal’s anonymous reviewers and Prof. Nigel Gilbert for their helpful comments.

Appendix: The Dynamics of the Model
Figures A1 and A2 illustrate the dynamics of the number of mobilized sites and of activated identities, respectively, in $N = 100$ systems:

**Figure A1. Dynamics of Mobilized Sites**

NOTE: $Q = 25$, $a = 0.1$, and $m = 0.001$. Fifty runs are collected at each parameter setting.

**Figure A2. Dynamics of Identity**

NOTE: $Q = 25$, $a = 0.1$, and $m = 0.001$. Fifty runs are collected at each parameter setting.

Figure A1 indicates that all sites are mobilized approximately before $4.0\times10^5$ steps. Meanwhile, Figure A2 shows that the number of activated identities ($I$) first rapidly increases and then slowly decreases, especially in the cases indicated by rhombuses or squares (this decrease is caused by identity dissemination). However, the value of $I$ stabilizes in later steps. Based on these results, this paper employs $3.0\times10^6$ as the length of the dynamics in the analysis of Models 1–3.

**References**


