

The Institutionalization of Identity: Micro Adaptation, Macro Effects, and Collective Consequences

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Abstract

The Agent Based Identity Repertoire (ABIR) model was used to investigate processes of institutionalization conceived of as increasing returns to size in the effect of size that produce disproportionate increases in resistance to change in status or reduction in size. Particular attention was devoted to the identification and result of thresholds of institutionalization as mechanisms for the translation of micro patterns of adaptation into macro effects. Landscapes were designed as models of polities whose inhabitants possessed repertoires of identities. Each of these agents is activated on one of these identities at each time period. Histories of landscapes included periods of significant and rapid fluctuations in biases assigned to different identities, variation in the number of alternative identities present in the landscape, variation in the initial size of the portion of the landscape controlled by the dominant identity, and networks of influential agents—“organic intellectuals.” Strong evidence was found for the emergence of identity institutionalization, for the existence of a “crystallization” threshold, for the effectiveness of divide and rule strategies for the maintenance of an identity as dominant, for the efficacy of a network of organic intellectuals, and for hegemonic levels of institutionalization. Thresholds leading to hegemony were not observed.

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Hegemony and the Conventional Wisdom of Constructivism

Constructivist theories of identity represent one way in which the self-organizing idea underlying constructivism in general is deployed. We are, and feel ourselves to be, certain types of human beings according to apperceptions that are constituted by processes and forces larger than our identities--the stable syndromes of associations, feelings, and beliefs we refer to when we use that term. The fundamental insight is that the social world is not given to us as pre-organized in some immutable fashion, but that the categories of action and interpretation that help us produce and reproduce a familiar world are themselves constructed out of processes in which we participate, but which we may or may not understand. Our own participation in these processes may be based on, or best interpreted according to, models of instrumentally rational calculations, simple algorithmic reactions, reflexive or "instinctual" behaviors, externally coerced or induced choices, etc. Although these activities affect who we will be by affecting the circumstances we will encounter, there is no escaping the extent to which the structure of possibilities and influences surrounding our behavior produces, constructs, or indeed "constitutes," our identities.

This complex and recursive process is vastly different from the primordialist image of human identities as fixed by pre-history, nature, or nature's God--immutable constants of individual and collective life, as independent but never dependent variables. Few scholars today in any field mourn the passing of classic primordialist beliefs about why people behave the way they do and in retrospect it is even difficult to identify scholars who ever made the hard-core "zoological" argument. But against the tide of constructivism many scholars of ethnic, religious, national, and other collective identities, have raised the question of how some of these identities can be so regular, long-lasting, reliable, and sustained if the world is as complex, the external constitutive forces as powerful, and identities as fluidly as constructivist theory would have us believe. Perhaps the most influential approach has been to identify nationalism, or political identities like nationalism, with the imperatives of industrial civilization.¹ Others search for clues in evolutionary psychology, analyzing how ethnic or national solidarities may function as equivalents to selected behaviors in the ancestral environment.² Others have argued more simply that ethnicity and nationalism are best understood as constructed

extensions of kinship associations or territorialist identifications, but constructions whose tenacity is based on real propensities of human beings to be more powerfully motivated by such tropes than by others.³

These scholars observe that in principle constructivism is everywhere and always, and that all categories and dispositions are formed, shaped, reformable, and reshapable according to processes larger than themselves. Still all is not experienced as artifactual. Within the time frames that matter to us and with regard to our own consciousness of our social world, identities can take on the aspect of immutability, of naturalness—what Ronald Suny has called “provisional stabilizations.”⁴ These fixtures, these lodestars of our lives, can function as if they are permanent, mainly because their permanence is an unexamined, indeed an unposed, question.

But how is this naturalness achieved? Postmodernist thinking is based on the “deconstruction” of that which modernism has encouraged us to accept as natural and real. But equally interesting is how beliefs, norms, and understandings that are experienced as real and natural, despite their fundamental artifactuality, are established as such. The research program of which this paper is a part also seeks, not simply to demonstrate artifactuality and the possibility of deconstruction, but to discover the patterns and mechanisms that determine how resistant these constructions can be to deconstruction. In other words, we are out to examine the institutionalization and deinstitutionalization processes governing identities and other beliefs and norms--their construction and deconstruction. Of particular interest to us is that form of institutionalization known as “hegemony.” Applied to the issue of collective identity, we ask how naturalized, seemingly immutable identities arise, and in what patterns those “hegemonic” identities can lose their status as such.⁵

Most attempts to study hegemony and broader processes of the institutionalization of norms, beliefs, or identities have entailed field work or historical research aiming to uncover the unarticulated but controlling conceptions that, hypothetically, prevent actors from perceiving and pursuing their actual interests. Through synchronic or diachronic comparisons and counterfactual inference the effects of these presumptive beliefs, mindsets, or unchosen frameworks of understanding have

been evaluated.⁶ Unable to directly observe or inquire about beliefs that, by definition, are not entertained or understood, these researchers have had to develop elaborate research strategies. Although able to make plausible arguments about the existence of hegemony and its distortive but stabilizing effects, they and others have been less successful at developing propositions about the conditions under which it arises or can be removed.

Agent-Based Modeling as a Technique for Studying Hegemony

In this research we attack this problem in a very different way. Instead of immersing ourselves in the details of histories of specific cases, groups, and episodes, we use computer simulations of agents that have been modeled as closely as possible to the way constructivist theory models human beings to generate hundreds of virtual “histories.” The conditions used to generate these histories are designed to control for variables hypothesized to be relevant to the production, maintenance, or elimination of collective identities. In previous work we compared the Agent-Based Identity Repertoire (ABIR) model to other agent-based or computational simulation models applied to cultural identity questions, and reported the results of experiments which corroborated and elaborated some of the basic propositions of constructivist theory.⁷ In that work we focused particularly on the implications of changing repertoire size as a determinate of overall patterns of collective identity formation. Here we are less interested in the implications of variation in the type of agent involved and more interested in the way patterns produced by micro-level behavior emerge as mechanisms shaping outcomes at the macro-level.

A brief description of the ABIR model is in order here (see footnote 8 for more details). The ABIR model produces two dimensional landscapes inhabited by square shaped agents. Each agent is activated on one of the (color-coded) identities it has in its repertoire. The identities in its repertoire are drawn at the beginning of time as a subset of identities present across the entire agent population in the landscape. Each square-shaped agent is standardly assigned an influence value of "1." In every time step every agent calculates an identity weight for activated identities it sees by assigning one unit of identity weight to each identity for every agent activated on that particular identity in its

Moore neighborhood (includes itself and the eight agents adjacent to it along its sides and at its corners). Each agent then adds or subtracts units of identity weight for different identities depending on biases present at that time step in the environment that "advantage" or "disadvantage" them.

If as the result of these calculations the agent determines that no other identity present in its repertoire has an identity weight that is two units greater than the identity weight of its activated identity, then it remains activated on its current identity. If it registers an identity weight for an identity in its repertoire that is at least two units greater than the identity weight of its currently activated identity, it deactivates that identity and activates the new one. If it finds that an identity not in its repertoire has an identity weight that is five or more identity weight units greater than the identity weight of its activated identity, then it replaces one identity in its repertoire with that identity and can subsequently activate the newly acquired identity.⁸ (For sample screenshots of landscapes used in experiments reported in this paper see below, Figures 2 and 8.)

Since a key feature of any institutionalization process is the appearance of a discontinuity in the relationship between aggregated pressures for change and their outcome, our virtual experiments seek to determine if such "threshold effects" can be observed to arise at the macro level in histories of interactions among large numbers of agents when the algorithms governing individual agent behavior at the micro level make no provision for such macro effects. We then examine patterns of variation in large numbers of histories run from the same or comparable initial conditions in order to answer questions about institutionalization and deinstitutionalization of collective identities.

Experimental Objectives and Hypotheses

One objective was to explore the emergence of hegemony—identities whose survival as dominant is so secure that their replacement is virtually impossible under stable conditions and rare even under conditions of environmental turbulence, or stress. We wanted to investigate the process of "institutionalization" whereby marginal or linear increases in the prevalence of an identity in a polity, or landscape, would produce

substantial or even non-linear increases in the subsequent presence of that identity and/or its likelihood to achieve or retain its dominance (plurality) against other identities.

We hypothesized a threshold effect in the pattern of increase in the resistance to dominant identity replacement as the size of its presence in the population increases and in the extent to which it becomes activated by other agents in the landscape.

Indeed, in line with Lustick's two threshold theory of institutionalization, we undertook our experiments with the expectation of finding two points of discontinuity—a crystallization or "regime" threshold and a "hegemonic" threshold. We expected that challenges to and replacement of dominant identities would be normal and frequent under conditions of stress prior to passage of the first threshold, much less likely between the first and second thresholds, and extremely rare beyond the second threshold.

The experiments we designed with regard to the conditions of deinstitutionalization were inspired in part by Lustick's 1993 presentation of his theory of hegemonic institutionalization. He suggested three variables to help explain the institutionalization or deinstitutionalization of a hegemonic identity—the presence or absence of:

- Gross discrepancies between the claims of an identity project and the realities of the world in which it operates;
- Alternative interpretations of reality, or alternative projects with at least an abstract appeal to inhabitants of the political space;
- Political entrepreneurs—risk-taking, imaginative leaders inclined to exploit opportunities for large gains in the face of small odds.

Experiments reported here were conducted in two phases. In Phase 1 we ignored the third (leadership) variable while focusing on the first two. We proceeded by generating simulated histories with the ABIR model designed to explore the effects of these variables on the ability of institutionalized identities to control of more of the landscape than any other identity and to resist loss of that status. We expected that increasing the number of viable rivals to the dominant identity—identities activated upon

by substantial portions of the landscape--would decrease the likelihood of dominant identities enduring periods of stress. Furthermore, we expected that longer periods of stress, entailing more sustained exposure of dominant identities to unfriendly environments, would increase the probability that dominant identities would be replaced. However, we did not expect to find that the presence of many alternatives or longer periods of stress would guarantee that replacement of dominant identities, at any level of institutionalization.

In Phase 2 we greatly simplified our landscapes by reducing the number of available identities from 15 to 4 while reducing the repertoire of each agent from 5 to 2. In some of these experiments we also designed the landscapes so that histories would begin with all agents in the landscape activated on one of only two of the available identities. To evaluate the implications of “divide and rule” opportunities for sustaining different levels of dominance we produced histories with three subordinate identities confronting one dominant identity. In these simplified environments we also introduced the leadership variable by testing one of Gramsci’s hypotheses about the role of “organic intellectuals.” Would a network of particularly persuasive agents make a strong contribution to an identity group’s ability to achieve and sustain hegemonic levels of dominance?

Thus in Phase 2 we begin to consider the leadership variable in relation to processes of institutionalization. By examining the role of leadership in an agent-based model, the practical political importance of the presence of institutionalization thresholds can more easily be appreciated. For example, leaders of identity based political groups could acquire knowledge about where their group’s present level of collective strength was located in relation to a crystallization threshold and use it in their mobilization efforts. Assuming resources applied to efforts to attract new recruits or to mobilize followers are scarce, then such leaders would significantly benefit by escalating their efforts in zones immediately adjacent to either side of the threshold (to achieve high marginal returns on resources expended or avoid drastic losses from marginal lapses of effort) while de-escalating their efforts in zones further from the threshold.

For both sets of experiments we use the same operational definitions and measures:

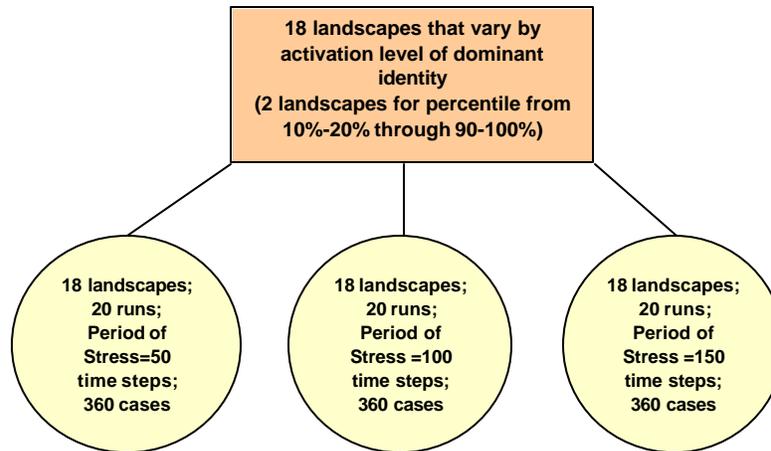
- An identity is institutionalized insofar as the level of its presence in the complexion of the polity (landscape) endures despite sustained exposure to negative incentives for its expression.
- An identity has passed a threshold of institutionalization if a nonlinear shift occurs such that the ratio of change in size to change in effect of size is no greater than one to three. This must occur within an interval representing no more than ten per cent of the range of variation in size. The change in the effect of size must represent at least thirty per cent of the difference between the minimum and maximum observations. Moreover, the average effect of size following the shift must be larger than the average effect of size prior to the shift by a margin of at least 30%.
- An identity is hegemonically institutionalized if its preeminence in the complexion of the polity endures in at least 90% of its histories.⁹

Phase 1 Experiments

In Phase 1 we used landscapes (two dimensional artificial worlds) inhabited by agents sharing a total of 15 identity options, with each agent possessing in its repertoire 5 of these identities at any one time, one of which would be the agent's "activated" identity—visibly marked by a distinctive color on the computer display. In the first phase experiments we generated landscapes at time step 500 with a wide variety of distributions of activated identities and then culled those which fit our experimental needs

We generated these landscapes by beginning at time step 0 ($t=0$) with landscapes with agents activated in a random pattern, each activated on one of the 15 available identities. We ran many such landscapes from $t=0$ to $t=500$, observing in each how many agents were exhibiting the dominant (most prevalent) identity (DI) at time 500. We collected the first two evolved landscapes (i.e. histories) that featured, at $t=500$, DI's that included between 20% and 30%, 30% and 40%, ... 90% to 100%. By the end of the process we had collected and saved eighteen landscapes.

Figure 1

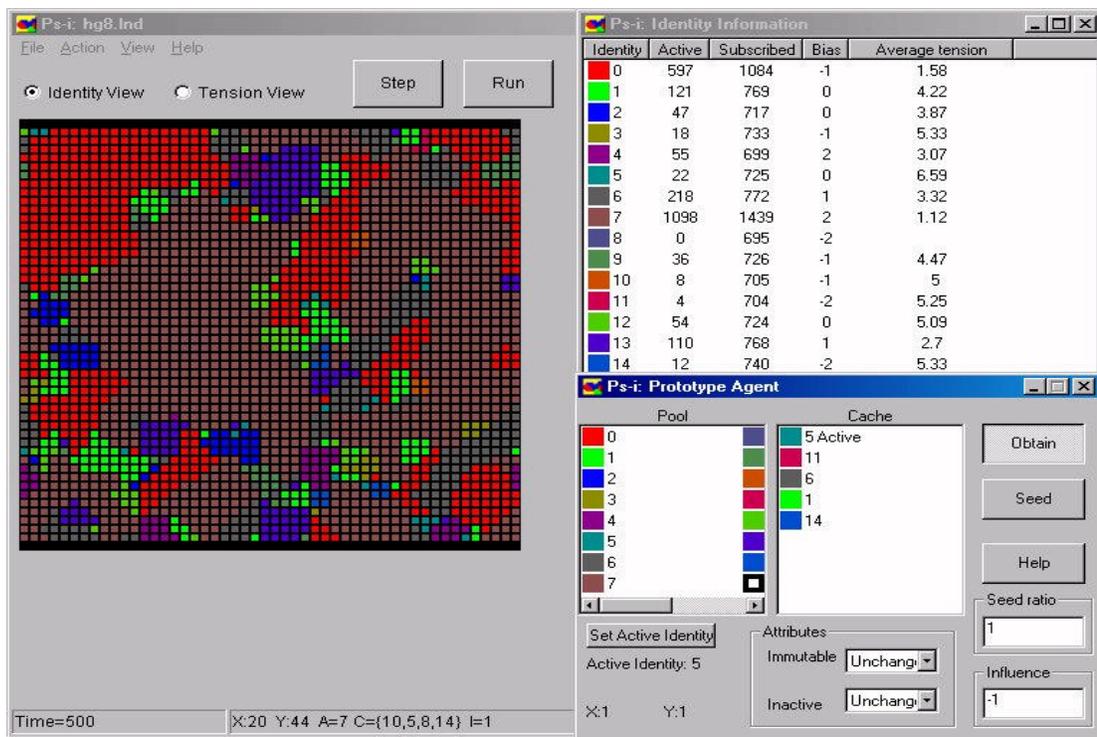


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Next, we ran each landscape 60 times to $t=1000$. Each of these 1080 histories began at $t=500$ and included an initial period of 100 time steps to $t=600$ within environments modeled as stable but not stagnant. In this period of historical "consolidation" bias volatility (the number of times out of 1000 time steps that any particular identity is eligible for a random change in the bias assigned to it) was set at 0.005, and "bias range" (the interval within which assigned biases can vary when they do change) was set at $-2/+1$. We then increased these settings to a volatility of .05 and a range of $-4/+3$ for successively longer periods (600-650; 600-700; 600-750), allowing each history to evolve beyond these stressful periods under relatively "stable" conditions of .005 and $-2/+1$ to $t=1000$. These manipulations were intended to produce histories characterized by cumulative increases in the probability that changes in the environment would occur that would threaten the integrity of the dominant identity. This protocol enabled us to explore the impact of "gross discrepancies" on the sustainability of

dominance at different levels of initial dominance. We intended thereby to observe the ability of dominant identities enjoying variable initial advantages to institutionalize their dominance and to observe patterns of deinstitutionalization of dominant identities at different levels of dominance. At the end of the production of our experimental histories we had information that varied both by the activation level for the dominant identity at $t=600$, as well as by the length of the stress that the dominant identity faced (see Figure 1; see also Figure 2 for a sample of a typical screen shot of a landscape used in Phase 1.)

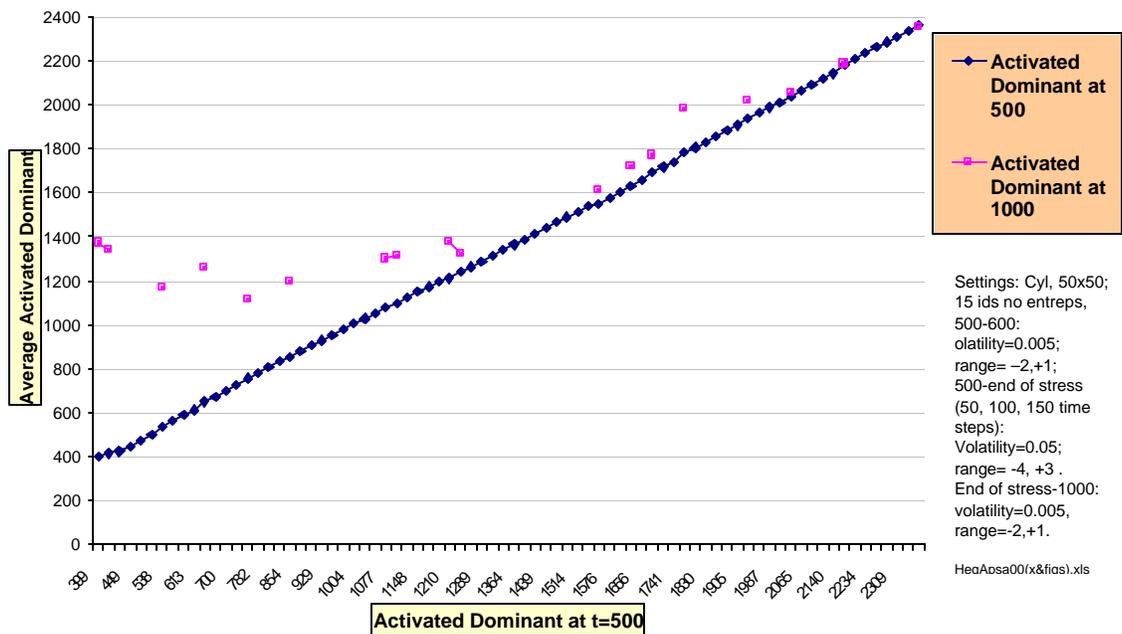
Figure 2



Findings

We suggested, first, that size matters and that we would observe increasing returns to initial size as we measured the effect of size on the likelihood and extent of dominance in subsequent periods.

Figure 3: Effect of Change in Size of Dominant Plurality on Post-Stress Size of Dominant



In Figure 3 we report results from the 677 histories, of the 1080 produced, in which the dominant identity at $t=500$ was also the dominant identity at $t=1000$. Along the Y-axis we compare the average number of agents activated on the dominant identity at $t=1000$ to the number activated on that identity at $t=500$. The X-axis in Figure 3 represents agents activated on the dominant identity at $t=500$. Note that only eighteen landscapes with an uneven distribution of dominance at $t=500$ were used. The continuous line tracing rising numbers of dominant activated at $t=500$ is included for heuristic purposes only—to indicate what the curve would look like if we had had access to linearly increasing sizes of dominance at $t=500$ and if the size of DI at $t=500$ equaled its size at $t=1000$.

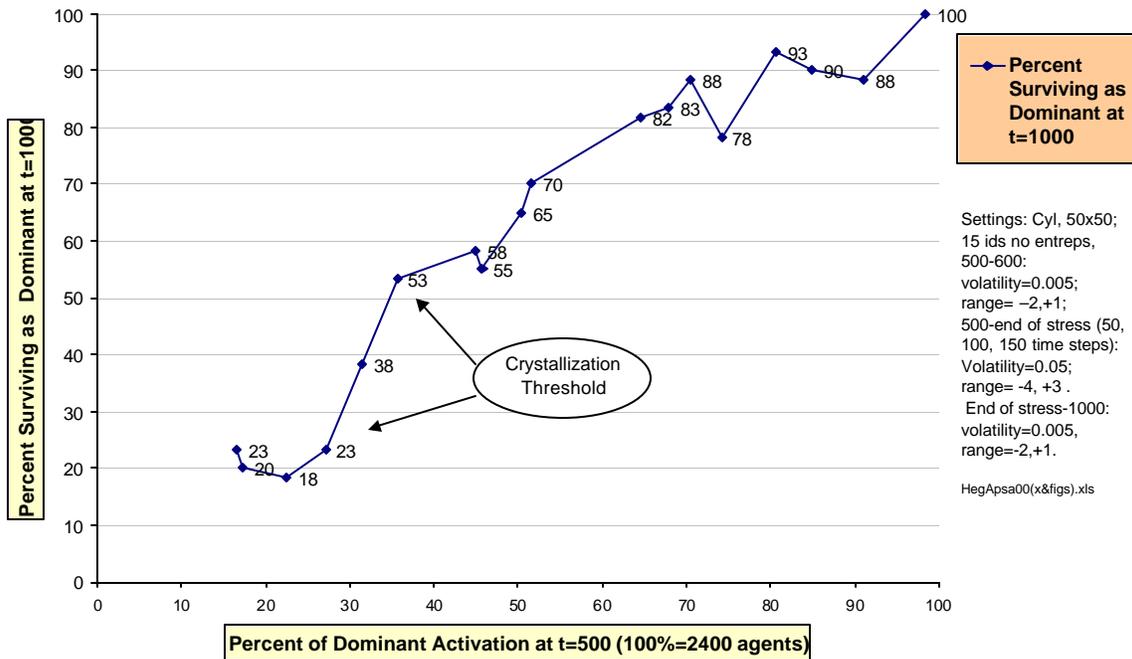
We see that our expectation that size matters was met in the sense that even a very small margin of relative superiority (an identity controlling even a small amount more of the landscape than any other identity) tended to produce very large increases in average size of dominance for that identity at $t=1000$. Contrary to our initial expectations, however, we observe diminishing returns to increases in size of DI at $t=500$. And once DI at $t=500$ reaches 50% there is little or no return to size when measured by the average

of DI at $t=1000$. On the other hand we can say that size did matter in that as long as the total number of non-dominant agents (activated on a multiplicity of identities) at $t=500$ was more than 50%, efforts by agents expressing the dominant identity (i.e. holding a plurality of the landscape) to extend their dominance were thwarted. In neither respect, however, can we say that a threshold effect was observed.

However, another way to ask about increasing returns to size is to consider the changing likelihood that dominant identities expressed by larger numbers of agents early in our histories would remain dominant at the end of those histories. This is a more important question to the extent that we are interested in whether a particular identity group can maintain its dominance, or primacy, in a heterogeneous polity rather than in the absolute amount of growth it is able to achieve. Considering all 1080 of our histories together, regardless of the length of the period of stress they endured, 677 (62.7%) featured identities dominant at the outset that were also dominant at $t=1000$. Correspondingly, 403 (37.3%) did not retain their dominance by $t=1000$ but instead were replaced, as the most prominent identity in the landscape, by another identity.

If these aggregate observations are analyzed we can see a clear and non-linear relationship between increasing dominance at the time 500 and increasing likelihood of remaining the dominant identity at time 1000. Figure 4 presents the effect of level of activation of the dominant identity at 500 on the survival of that identity as dominant at time step 1000. Here we do see evidence that the ability of a dominant identity to survive the entire history as dominant is positively related to the level of activation of that same identity at the early stages of history (time step 500).

Figure 4: Effect of size of dominant identity (DI) at t=500 on the survival of that identity as dominant at t=1000



At very low levels of initial size, dominant identities are here expressed by fewer than 650 agents (or less than 27% of the population). The rate of survival of these identities as dominant at t=1000 averaged 20%. For all the histories in which the dominant identity had a level of activation at t=500 of under 27%, no more than 23% of the dominant identities were also dominant at t=1000. When we look at all the histories with initial activation levels of the dominant identity of 65% (1551 agents) or more we see that more than 78% of what we may think of as dominant identity projects at time step 500 survived as dominant at t=1000.

What factors contributed to this pattern of increasing return to size despite the presence of stressful or turbulent conditions? What features of the situation serve as mechanisms governing the likelihood of continued dominance, the scale of that dominance, and its resistance to replacement? To what extent can the hypotheses outlined above, concerning thresholds of institutionalization, gross discrepancies, and available alternatives provide convincing answers to these questions?

There does appear to be a sudden and substantial shift in the relationship between size of dominance and the effect of that dominance. This nonlinearity occurred within the range of a dominant identity at $t=500$ expressed by between 27% (650) and 36% (854) of agents in the landscape. Applying the operational definition of threshold provided earlier we can in fact see that this nonlinearity does include a threshold of institutionalization. First, the ratio of change in the size of the DI at $t=1000$ to change in the size of DI at $t=500$ is more than or equal to 3:1 $\{ [53\%-23\%]/23 = 1.3; 1.3/[(36\%-27\%)/27\%=.33] = 3.9$. Second, the change in DI at $t=500$ is less than or equal to 10% of the entire range of values observed for DI at 500 $[0.1(1961)= 196.1; 854-650=204]$. Third, the amount of increase in identity institutionalization within the threshold zone (30%) is no less than 30% of the total increase of identity institutionalization observed $(100\%-18\%=82\%; .3 \times 82\% = 25\%)$. Fourth, the average size of DI at $t=1000$ for histories produced from landscapes on the high side of the threshold zone (79%) is higher than the highest observation in the threshold zone (53%) while the average size of DI at $t=1000$ for histories produced from landscapes on the low side of the threshold zone (20%) does not exceed the lowest observation in the threshold zone (23%).

The effect of this threshold is apparent in a pattern of dominance at $t=1000$ that is much more pronounced than prior to it. Values rise significantly and then reach a kind of plateau. An important factor in understanding this plateau effect is that values of DI at $t=1000$ cannot exceed 2400 (the total number of agents in the landscape). Before arriving at this plateau, where average DI at $t=1000$ is very high, do we see a second threshold at work—a hegemonic threshold? No we do not. Using the values that would appear to present the best candidate for a second threshold, observations 55% and 82% on the Y-axis, we find as follows. The ratio of change in the size of the DI at $t=1000$ to change in the size of DI at $t=500$ is less than 3:1 $\{ [82\%-55\%]/55 = 0.5; .5/[(65\%-46\%)/46\%=.4] = 1.25$. Moreover the change in DI at $t=500$ is more than 10% of the entire range of values observed for DI at 500 $[0.1(1961)= 196.1; 1551-1098 = 453; 196.1/453= 27\%]$. Accordingly it does not matter that the average size of DI at $t=1000$ for histories produced from landscapes on the high side of the zone (89%) is higher than the highest observation in the zone (82%) while the average size of DI at $t=1000$ for

histories produced from landscapes on the low side of the zone (33%) does not exceed the lowest observation in the threshold zone (55%).

Although a second threshold leading to hegemonic levels of identity institutionalization is not observed in this data, significant increases in the reliability of the reproduction of dominance to hegemonic status are observed. Our operational definition of “hegemonic institutionalization” requires a dominant identity to survive as dominant in at least 90% of its histories. Figure 4 shows that when histories involving all three stress conditions are aggregated, this standard was met for the first time when DI at t=500 was 1937 (81% of the landscape) and two out of three times thereafter.

Parsing this data helps to reveal conditions that produced or discouraged attainment of hegemonic institutionalization.

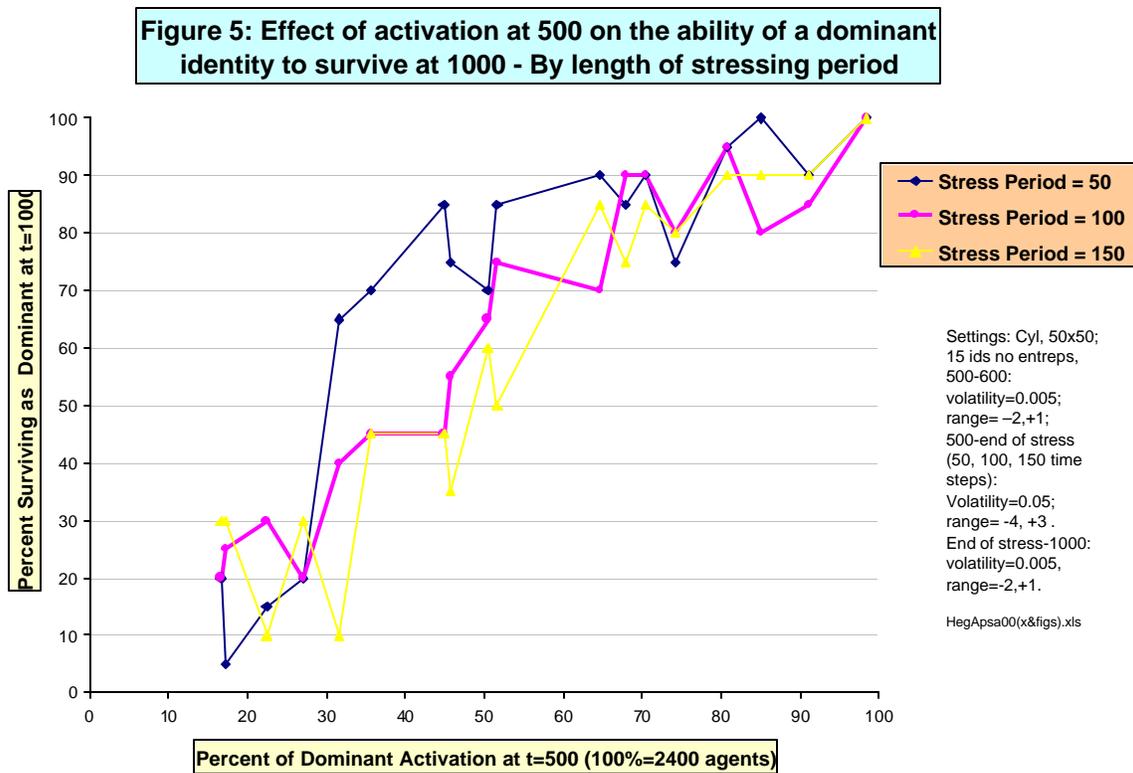


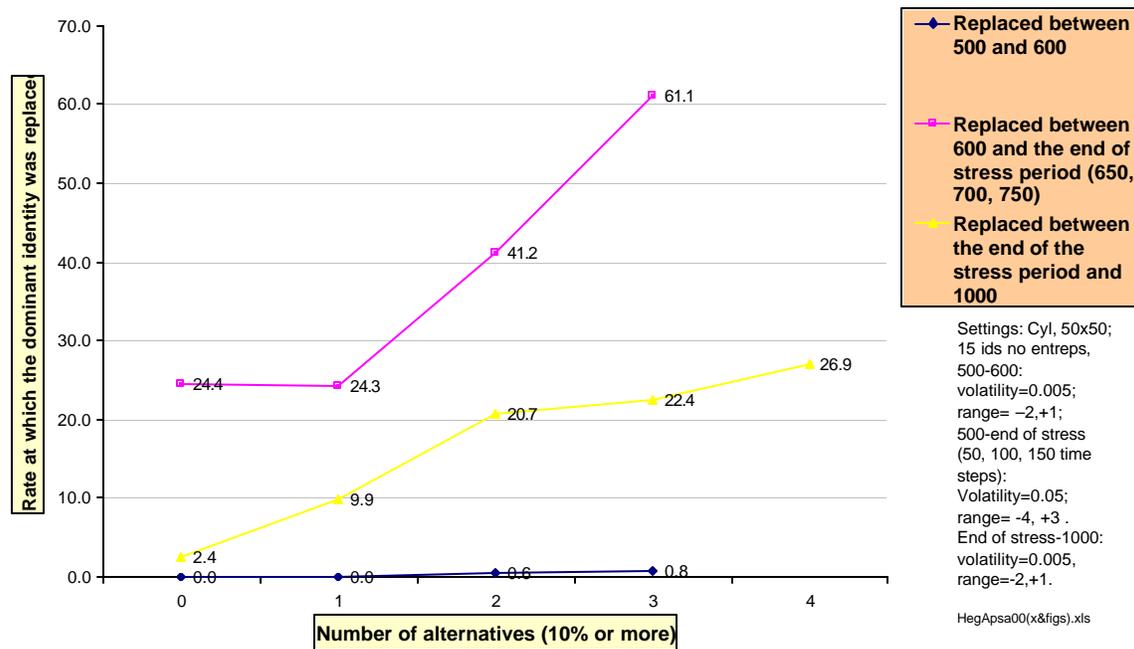
Figure 5 is a disaggregation of the graph in Figure 4 showing, for histories including stressful periods of 50, 100, and 150 time steps, the rates of dominance at t=1000 for different DI's at t=500. Here we see that our standard for hegemonic institutionalization (dominance reproduction in at least 90% of histories) was met for the first time by the

stress=50 histories when DI at $t=500$ was 65%; by the stress=100 histories when DI at $t=500$ was 68%; and by the stress=150 histories when DI at $t=500$ was 81%. However, the point beyond which these respective groups of histories did not fall beneath the standard was 81% for stress=50; 98% for stress =100; and 81% for stress=150. Although the difficulties which many histories within the stress=100 category clearly had in maintaining very high levels of dominance at $t=1000$ somewhat cloud the picture, it does appear that DI's encountering only 50 time steps of stress had a significantly easier time achieving hegemonic status than did DI's which encountered lengthier periods of stress—either 100 or 150. We interpret this finding as corroboration for our hypothesis that the presence or absence of “gross discrepancies” between claims of identity projects and signals indicating the appropriateness of those claims, would affect opportunities for both the construction of hegemony and its deconstruction.

As indicated above these experiments were also designed to examine the effects of the existence of credible alternatives for dominance on the sustainability of dominance through and after periods of stress. For this purpose we defined alternative as any non-dominant identity that was expressed at $t=500$ by more than 10% of agents on the landscape. These alternatives could be expressing any one of the 14 non-dominant identities present across the landscape at $t=0$, apart from the dominant identity.

Figure 6 presents data showing the relationship between variation in the number of alternative identities (AI's) and the likelihood that one of these alternatives would replace the DI and itself became dominant across all types of stressed histories and all levels of dominance at $t=500$.

Figure 6: Effect of number of alternatives on the replacement rate of the dominant identity by historical period



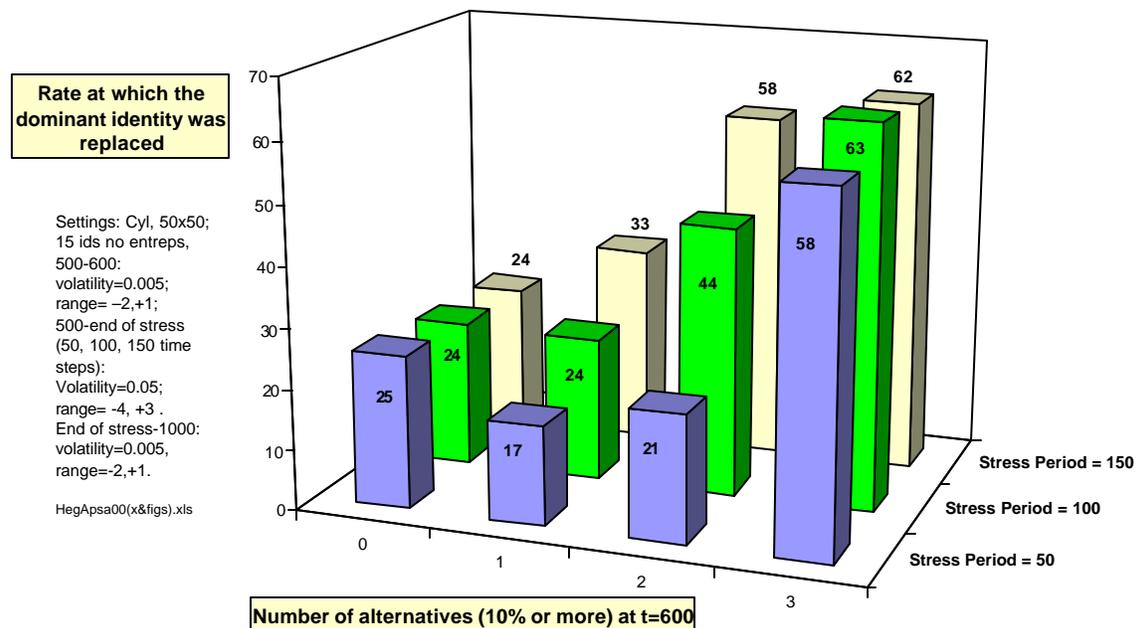
We see that the presence of alternatives makes a difference, but only when stress is or has been present in the history of the landscape. Thus we see that regardless of how many alternatives are present virtually no replacements occur in the absence of a stressful period (that is, before $t=600$ —line 0.0 to 0.8). As we expected, the absence of environmental turbulence gives alternatives almost no opportunity to overcome initial advantages enjoyed by the DI by enjoying unusually high biases while the DI experiences unusually low biases. However, the prospects for AI's becoming DI's increase sharply during periods of stress—between 24% and 61% depending on the number of alternatives.

In the environmentally stable periods following the stressful punctuations the likelihood of an alternative replacing a dominant identity decreased. This decrease occurred even though the periods after the stressful punctuations were much longer than the periods of stress themselves. On the other hand, these probabilities, between 10% and 27%, were still quite high compared to replacement rates observed under comparable environmental conditions prior to the stressful punctuations.

Furthermore, we see that while the presence of one alternative during the period of stress does increase the likelihood of replacement of the dominant identity, an increase of another alternative (2 instead of 1) almost doubles the chance that a replacement will take place.¹⁰ When 3 AI's were present during the period of stress more than 60% of DI's were replaced. Thus we can still see that the number of alternatives makes a difference. Specifically, we observe that introducing one alternative triples the rate of replacement, adding another alternative (2) doubles that rate of replacement. Subsequent increases, to (3) and (4) alternatives produce gentler effects on replacement rates.

By comparing groups of histories in terms of both differences in the length of turbulent punctuations and the presence of different numbers of alternatives we can tease from our data the combinations of these variables that seem to make the most difference for processes of institutionalization (the crystallization of stable dominance patterns) and hegemony.

Figure 7: Effect of length of stress period and number of alternatives (t=600) on rate of replacement of the dominant identity by the end of stress period



In Figure 7 the X-axis is the number of alternative identities present¹¹ in the history at t=600 (that is at the beginning of the stress period). The Y-axis is the

percentage of histories featuring the replacement of the dominant identity, from $t=600$ to $t=1000$. The Z-axis is the length of the period of stress occurring in each group of histories. The numbers on or above each column represent the number of histories observed in that category. As we saw earlier, the prospects for increasing replacement rates, i.e. for breaking the domination of previously dominant landscapes, increase with increases in the length of the period of stress and the number of alternatives. However we see here that these effects are concentrated. Increasing the number of alternatives from 0 to 1 has mixed effects, depending on the length of the period of stress. But increasing the number of alternatives from 1 to 2 is associated with very large increases in replacement rates when the period of stress is 100 or 150. Increasing the number of alternatives from 2 to 3 more than triples the replacement rate for histories exposed to 50 time steps of turbulence, and increases the rate at 100 time steps of stress by nearly 50%. Increasing the duration of stress tends to increase replacement rates for conditions in which there are alternatives but makes no difference when no alternatives are present. In other words there are main effects for number of alternatives and duration of stress, and a complex interaction effect between them as well. When there are two or more alternatives and something more than a brief period of stress the probability of the DI being replaced is much greater than when there are fewer than two alternatives present and only a brief period of stress.

Overall what we learned from phase 1 of our experiments was that in a heterogeneous landscape, or polity, populated by agents with four alternative identities drawn from an array of fifteen possible identities:

- an institutionalization threshold is apparent in the emergence of dominant identities resistant to losing their dominance even when stressed;
- this “crystallization” threshold is located between values for baseline levels of dominance of 27% and 36%;
- no second hegemonic threshold was observed;
- the presence of hegemony was observed, but was not strong and was observed only in histories experiencing the shortest period of stress;

- both stressful environments, including biases inconsistent with the claims of dominant identities, and the presence of alternatives or challengers to the dominant identity, affected the likelihood that histories would end with the replacement of the initially dominant identity;
- the robustness of the effect of an increase in the number of challenging alternatives is substantially increased in interaction with extension of the duration of the period of stress to which dominant identities are exposed.

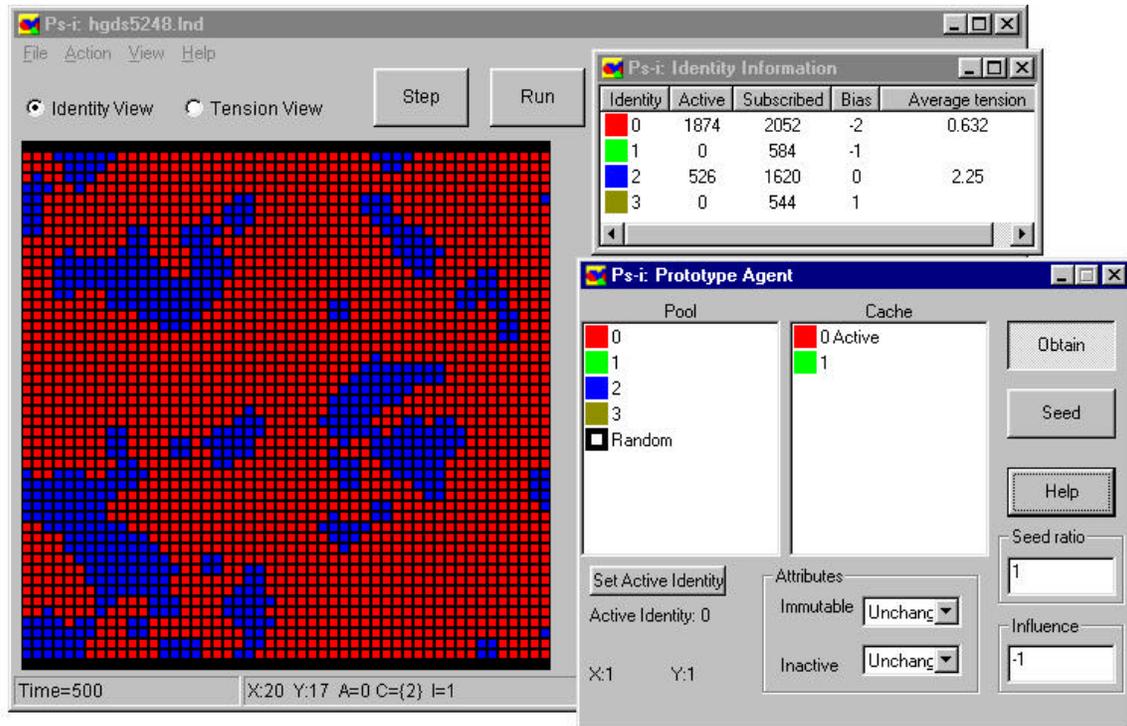
Phase 2 Experiments

In Phase 2 of our experiments we chose to study some of the same questions in a much simpler virtual environment. Therefore we prepared landscapes featuring only two visible identities—a dominant identity (red) and a subordinate identity (blue). We used basic landscape settings identical to those used in phase 1 (cylinder, 2400 agents in landscape). To encourage comparable levels of dynamism in such different landscapes we adjusted the “stable environment” setting for bias volatility from .005 to .009; but maintained the same bias range setting (-2,+1). We also changed the stress settings from bias volatility .05/bias range (-4,+3) to .05/(-2,+3). Our objective was to see if our hypotheses with respect to increasing returns to size, thresholds of institutionalization, and resistance to replacement, which received some support in the more heterogeneous environment, would be corroborated in the simplified environment even if stress levels were reduced. In addition we used this simplified experimental setting to begin to explore the third variable included in Lustick’s 1993 theory of hegemony—leadership, or at least a certain kind of leadership—the kind that provides organizational coherence to an identity group.

In our first Phase 2 experiment we seeded each of 11 landscapes with a different percentage of agents activated on the “dominant” (red) identity. The first landscape was seeded with *exactly* 50% red agents and 50% blue (“subordinate”) agents. The next was seeded with 51% red, 49% blue, and so forth, until the last was seeded with 60% red, 40% blue. We then ran each of the landscapes to $t=500$ twenty times (generating a total

of 220 landscapes) and recorded the outcomes¹². See Figure 8 for a typical screen shot of a landscape used in Phase 2.

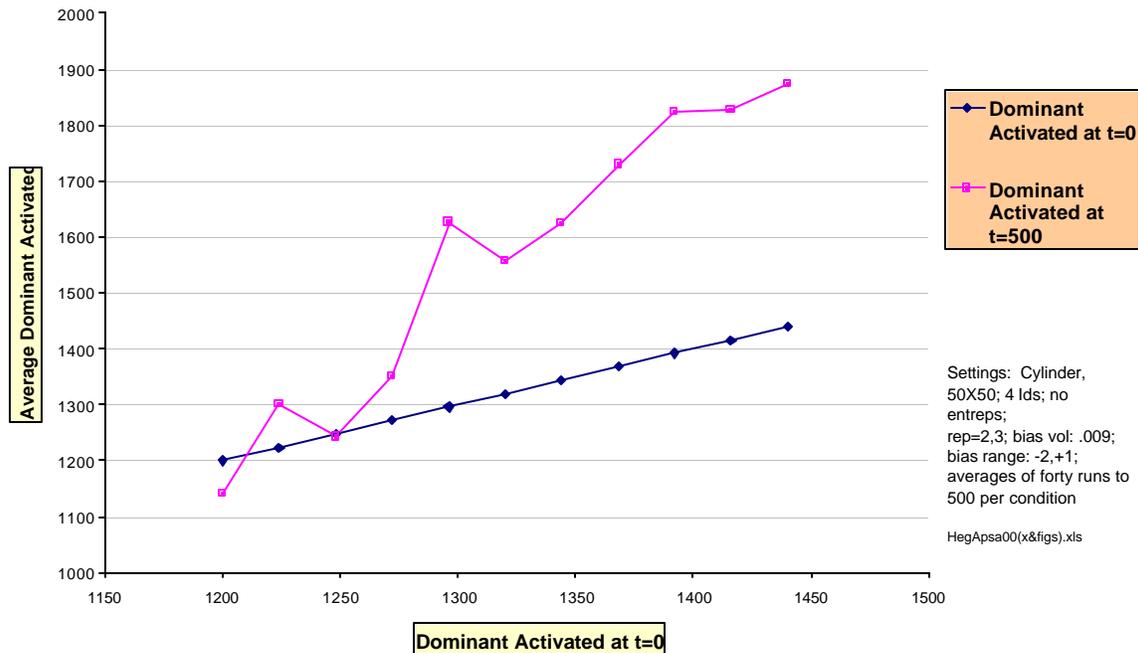
Figure 8



The results of this experiment are represented in Figure 9. As in Phase 1 experiments, we observed a clear relationship between level of early dominance and level of growth. Using the points corresponding to 53% (1272) and 54% (1296) as the boundaries for a possible (crystallization) threshold we make the following calculations. The ratio of change in the size of the DI at $t=500$ to variation in the size of DI at $t=0$ is more than 3:1 $\{ [1626-1351]/1351 = 0.2; .2/[(1296-1272)/1272=.02] = 10 \}$. Moreover the amount of change in DI at $t=0$ is equal to or less than 10% of the entire range of values observed for DI at $t=0$ $(1296-1272 = 24; 0.1[1440-1200=240] = 24)$. Also, the amount of increase in identity institutionalization within the threshold zone $(1626-1351 = 275)$ is at least 30% of the total increase of identity institutionalization observed $(.3 \times 731 = 219)$. Finally, the average size of DI at $t=500$ for histories produced from landscapes on the high side of the threshold zone (1739) is higher than the highest observation in the zone (1626) while the average size of DI at $t=500$ for histories

produced from landscapes on the low side of the zone (1228) does not exceed the lowest observation in the threshold zone (1351).

Figure 9: Effect of Initial Dominant/Subordinate Ratio at t=0 on Dominance at t=500 under Stable Conditions



Thus we can say that a threshold is present in the relationship between initial extent of dominance and subsequent extent of dominance under relatively stable conditions.

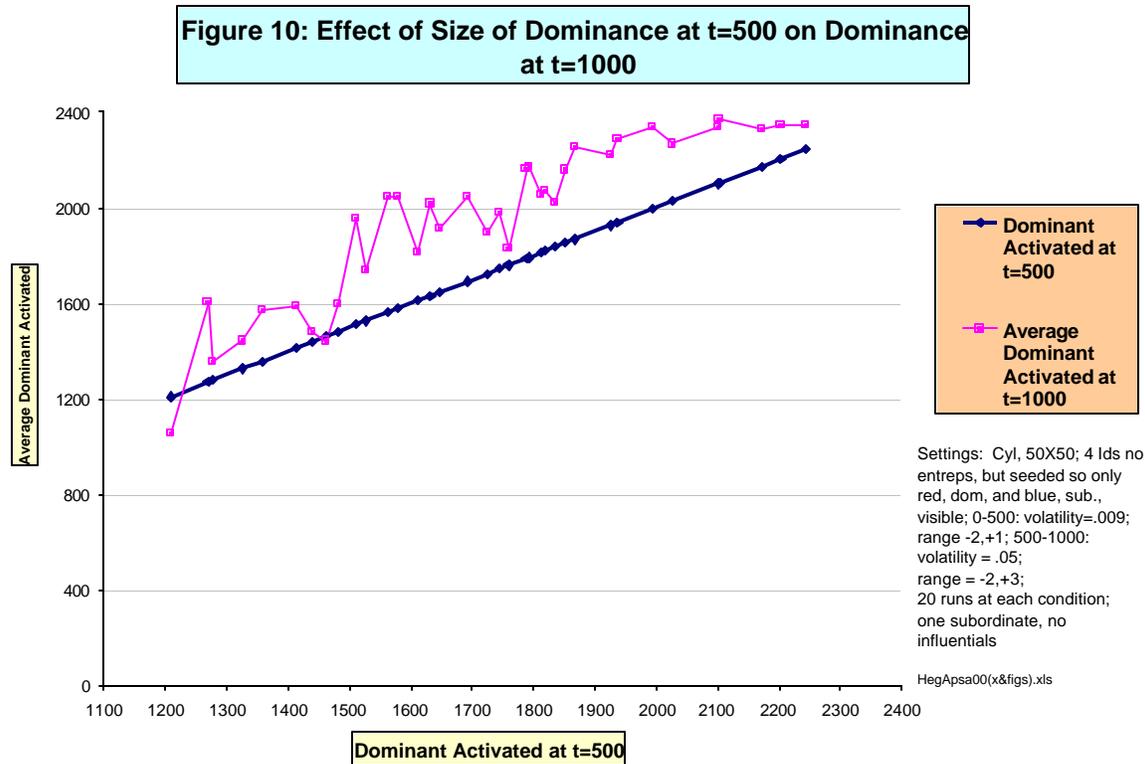
But again we ask, is there a second threshold—a hegemonic threshold? After a slight drop and a leveling off in average dominance at t=500 for histories produced from DI=55%-56% at t=0, we see two relatively sharp increases. However, although each of these increases along the X-axis (DI at 0) is ten per cent of the total range along that axis—thereby satisfying one requirement--neither increase—from 56% to 57% (105 agents) or from 57% to 58% (95 agents) produces an increase of at least 219 (30% along the Y-axis [DI at 500]). Moreover, our maximum observation of DI at t=500 was 78% (i.e. less than 90%). Thus within this relatively small range of variation for initial dominance under stable initial conditions (50%-60%) we observe (at t=500) increasing

returns to size after an initial threshold, but neither a second threshold nor the achievement of hegemonic levels of institutionalization.

It is instructive to compare these results to the data displayed in Figure 3. In the results of the Phase 1 experiment displayed in Figure 3 we did not see increasing returns in average dominance from increasing average dominance even under conditions of stress (which were found in other Phase 1 experiments to enhance the appearance of the increasing returns effect). Here we clearly did, even in the absence of stress. It seems that the appearance here of a pronounced institutionalization threshold was facilitated by the simplicity of the confrontation—a dominant identity vs. one subordinate identity, rather than 14 others. These results therefore support our initial expectation that identities predominate in an environment to the extent that they are more present in it to begin with. They also suggest that even relatively small margins of initial advantage can translate dependably into sustained levels of predominance.

In the second Phase 2 experiment, we wanted to examine the effect of stress in this simplified setting. Would the same pattern of a pronounced crystallization threshold followed by a rise to hegemonic institutionalization appear? And would the threshold appear at the same point in the baseline level for DI?

We began by selecting 37 landscapes from the 220 landscapes generated in the previously described experiment.¹³ The selected landscapes were spread across the entire range of dominance at $t=500$. The selected landscape with the highest level of dominance had 2,243 red agents at $t=500$, and the least dominant had only 1,209 red agents. Each of the 37 landscapes was then run to $t=1000$ twenty times, generating a total of 740 histories. Data from these runs is displayed in Figure 10.



Comparing the graph of this data to the display in Figure 9 is tricky. Recall that the data in Figure 9 was produced entirely by histories beginning with between 1200 (50%) and 1440 (60%) DI at t=0. Under the relatively stable conditions prevailing for those histories the result was a distinctive “S” shaped curve in which initial instability preceded a threshold increase between DI=53% - 54%. After this steep increase values continued rising until reaching reliably higher levels at DI at t=1000 of 58% (1392). In Figure 10, however, that initial DI range of 50 % to 60% represents sizes of the dominant identity at t=500, not t=0. Moreover it includes, not all histories observed but only the smallest twenty-five per cent of beginning DI’s registered along the X-axis. In Figure 10 we see a much rougher looking S-shaped curve¹⁴ with a steep rise bracketed by lower and higher levels, but with a jaggedness present in each of the lower and higher zones not found in Figure 9. We can suppose that the turbulence experienced by agents within these histories opened more opportunities for either the subordinate or the dominant identity to achieve lop-sided victories. Evidence for this hypothesis is drawn from the fact that the average standard deviation for histories run under the stable conditions up to

$t=500$ was 295.8 compared to an average standard deviation of 410.2 for histories reported in Figure 10 run under turbulent conditions.

Of interest as well is that the steep rise in the payoff of initial dominance under conditions of stress occurred only after the dominant identity controlled 61% of the landscape. In the earlier experiment, under stable conditions, we saw that the threshold appeared at levels of initial dominance of 53% and reached a plateau by 60%. It would appear, in other words, that stressful or turbulent conditions can produce favorable opportunities for the subordinate identity, but the returns to size may not be reliably enjoyed by the dominant identity until it establishes a substantially larger margin of superiority.

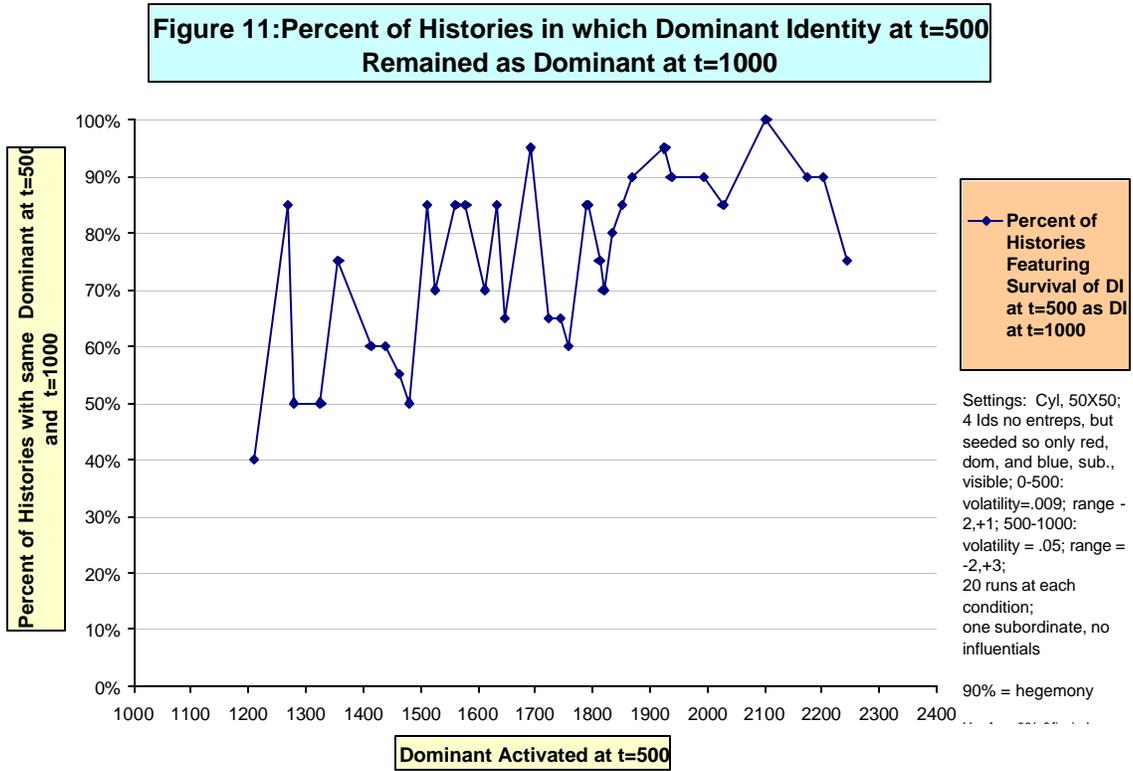
But can we consider that the rise in Figure 10, as steep as it may appear, contains a threshold of institutionalization. Applying our operational definition we make the following calculations. We use the eighth and twelfth observations of DI at 500 as the boundaries for the putative threshold zone. At these points DI at $t=500$ is 1463 (61% of the landscape) and 1511 (63% of the landscape); at $t=1000$ the observed values are 1954 (81%) and 1442 (61%). The ratio of change in the size of DI at $t=1000$ to variation in the size of DI at $t=500$ is more than 3:1 $\{[1954-1442]/1442 = .36; .36/[(1511-1463)/1463 = .03; .36/.03 = 12\}$. Moreover the amount of change at DI at $t=500$ ($1511 - 1463 = 48$) is less than 10% of the entire range of values observed for DI at $t=500$ ($2243-1209 = 1034$; $.1 \times 1034 = 103$). Also, the amount of increase in identity institutionalization within the threshold zone ($1954-1442 = 512$) is at least 30% of the total increase of identity institutionalization observed ($.3 \times [2343-1054 = 1289] = 387$). Furthermore, the average of observations to the high side of the zone containing the threshold exceeds the highest observation within it. However, the average of observations to the low side equals; but it does not exceed the minimum value within it (1442). Therefore, by our rules, we cannot characterize this increase as containing a threshold.

However, we can identify a threshold as located between the ninth and twelfth values for DI at $t=500$: 1481 and 1581, representing DI control over between 62% and 66% of the landscape at $t=500$. We see that $2049-1595/1595 = .28$; $1562-1481/1481 = .05$; $.28/.05 = 5.6$. Thus the ratio of change in the payoff to initial amount of dominance

is greater than 3 to 1. Again, the difference between the maximum and minimum observations for DI at $t=500$ is $2243-1209 = 1034$. Ten percent of this is 103, which exceeds the difference between the maximum and minimum observations within this interval ($1562-1481 = 81$). Furthermore, the amount of increase in identity institutionalization within the threshold zone is at least 30% of the total increase of identity institutionalization observed $\{.3 \times 1289 = 387; 2049-1595 = 454; 454 > 387\}$. Additionally, the average of observations to the high side of the zone containing the threshold (2136) exceeds the highest observation within it (2049) and the average of observations to the low side of the zone (1442) is less than the lowest observation within the zone (1481).

In Figure 3, with many identities present in the landscape and under stressful conditions, we saw that hegemonic levels of institutionalization (where at least 90% of the histories beginning with a particular size would survive as dominant at the end— $t=1000$) appeared first at the point where DI equaled 81% at the beginning of the histories, and two thirds of the times thereafter. Disaggregation of these data in Figure 4 showed that the onset of hegemonic levels of institutionalization was earliest (65% of DI at $t=500$) when the period of stress was brief (50 time steps). We also noted that for this condition and for the 150 time step stress condition hegemonic institutionalization was observed in every history beginning with $DI=81\%$ at $t=500$. Figure 11 displays the results of the same experiment described in Figure 10 with respect to the appearance of hegemonic levels of institutionalization (90% of histories beginning with a particular DI size survive as dominant to $t=1000$). We see a relatively jagged pattern in which even when DI at $t=500$ was 93% (2243) the subordinate identity at $t=500$ was able to become dominant in only 25% of the histories. Nonetheless we see that hegemonic levels of institutionalization were more likely as initial size of DI increased. To compare these data to the results displayed in Figure 3 we must note that values on the X-axis, for DI at $t=500$, begin here at 1209 (50%) whereas in Figure 3 they begin at 399 (17%). Also, the stress settings were somewhat different—the bias range was set to $-3,+4$ and the punctuations of stress were 50, 100, and 150 time steps. In this phase two experiment the bias range was $-2,+3$ and the period of stress was 500 time steps. While more controlled studies are clearly in order, we do see the suggestive result that in our simplified

landscape histories hegemony first appeared earlier, at 1692 or 71% of the landscape at t=500, than in the more heterogeneous and differently stressed histories, but that hegemony was reliably reproduced at roughly the same point in both experiments: 1868 or 78% of the landscape at t=500 in the Phase 2, simplified landscape compared to 1937 or 81% in the more complex Phase 1 landscape.



In general, then, these Phase 2 experiments, with the simplified landscape settings, partly corroborate patterns found in Phase 1 experiments. In both groups of experiments we found an "S" shaped curve of increasing returns to size; one crystallization threshold of institutionalization; and hegemonic levels of institutionalization achieved gradually but at roughly the same point. On the other hand, our data showed no threshold present in the relationship between initial size and effect of size in the Phase 1 experiment when the effect of size was measured by the average size of the DI at t=1000, but only when the effect of size was measured by the likelihood of remaining DI at t=1000. In Phase 2 experiments reported so far we found thresholds present in both stressed and non-stressed histories when the effect of size was measured by the average size of the DI at t=1000 (at 62%-66% in stressed histories and at 53%-

54% in non-stressed) but **no** institutionalization threshold when the effect of size was measured by the likelihood of remaining DI at $t=1000$. We believe this pattern is linked in complex ways to the opposite kind of opportunities and constraints, *vis a vis* maintenance of dominance and expansion of a dominant identity's presence, afforded by relatively heterogeneous vs. homogeneous landscapes (see below).

Our Phase 2 experiments were developed with an increased commitment to controlled comparison. Our purpose was to at least begin to explore the third variable identified by Lustick in his 1993 theory of hegemonic institutionalization and deinstitutionalization—leadership.

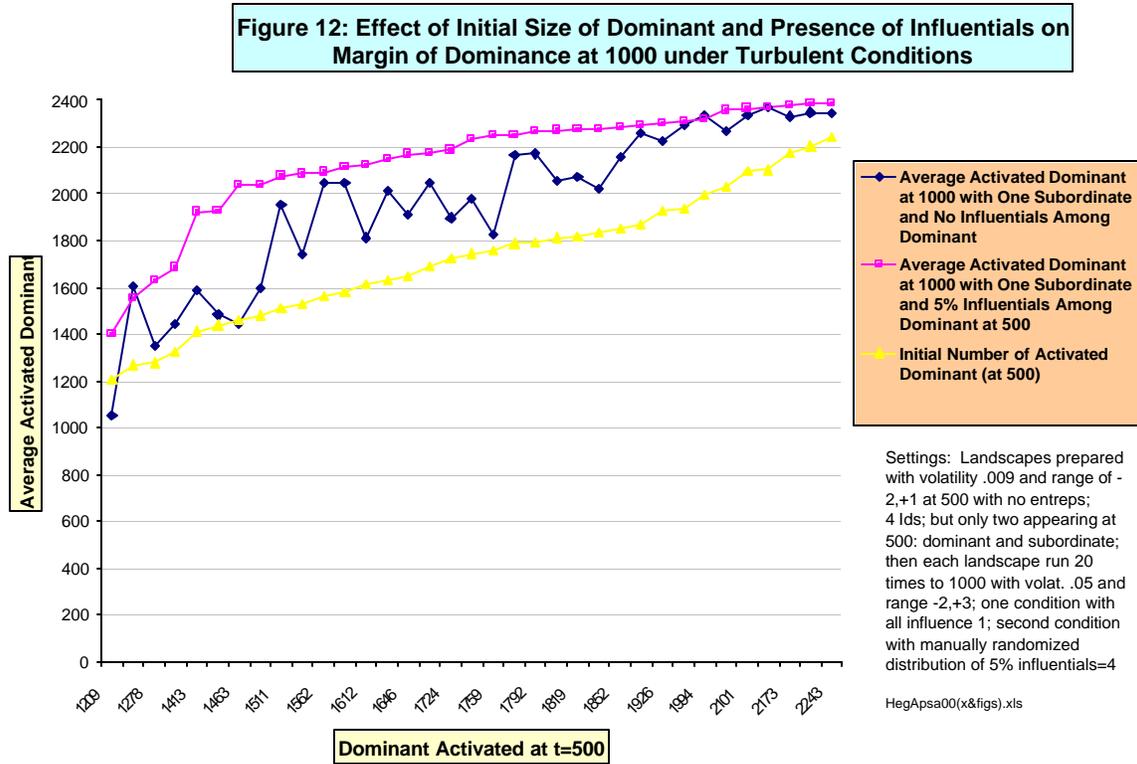
To this end we examined the effect of what Antonio Gramsci called “organic intellectuals,” the political equivalent of foremen on the factory floor, who serve, *vis a vis* hegemony, and by extension institutions, as the “whalebone in the corset.”¹⁵ We operationalized this notion by transforming, in each landscape, a randomly selected group of agents activated on the dominant identity. Each of these agents was endowed with extraordinary “persuasive” powers such that their influence on agents in their Moore neighborhood was counted as “4” rather than “1” in the calculation of identity weights. We hypothesized that adding networks of markedly influential agents to dominant identities would increase the stability of their dominance and relocate thresholds to lower levels of dominant identity presence in the landscape.

In our first experiment regarding the effect of “influentials” we maintained the turbulent environmental settings (volatility .05; range -2/+3) and fundamental structure of the last experiment (an array of landscapes beginning with two visible identities with four identities available across the landscape at $t=500$ containing DI's rising from 1209 to 2243), but changed the identity weight (influence) of 5% of the dominant (red) agents at $t=500$. We began with the 37 landscapes employed in the experiments reported in Figures 10 and 11. These landscapes increase from a $t=500$ presence of 1209 agents expressing the dominant identity (50%) to 2243 (93%). In each of these landscapes 5% of the agents activated on the dominant identity at $t=500$ were transformed into “influentials.” This was accomplished by randomly substituting with agents registering an influence level of “4” for existing dominant agents with the standard influence level of “1.” Thus

each influential agent (IA) present in the Moore neighborhood of any other agent would be included in the identity weight calculation of that agent as having a value of "4" rather than "1." with agents registering an influence level of "4." An IA can change identities and if it does it will subsequently wield its disproportionate weight on behalf of its newly activated identity.

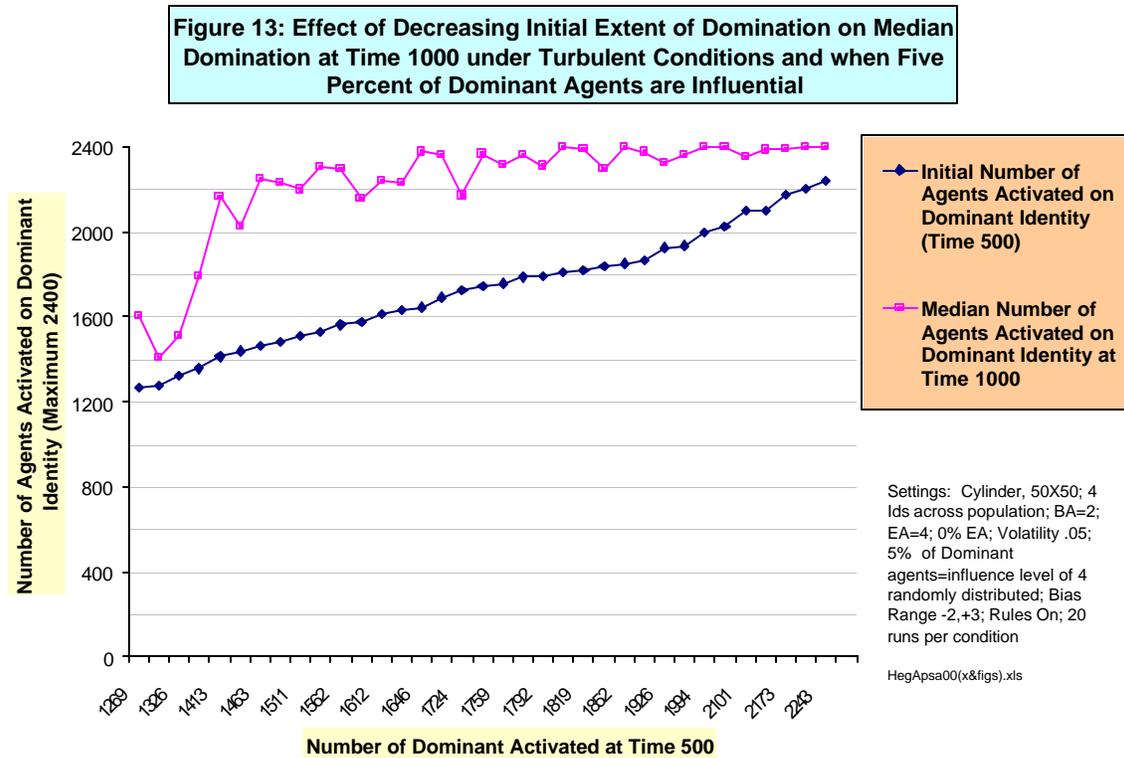
Figure 12 displays the results of running each of these 37 landscapes, with 5% of dominant agents operating as influentials, twenty times from their starting points at $t=500$ to $t=1000$ and compares them to data displayed in Figure 9--data gathered by running the same landscapes without the dominant influentials present at $t=500$.

Overall it appears that the presence of influentials helped the dominant identity respond earlier to turbulent environments and the challenge of one subordinate identity by achieving reliably high levels of dominance. In the curve describing histories of landscapes containing dominant influentials the steep rise in the payoff of initial dominance to the size of DI at the $t=1000$ occurred prior to and begins at a higher level than the curve describing histories of landscapes absent the dominant influentials. Although this rise is not steep enough to quite qualify as a threshold, the two curves are similar in that steep and early increases in the robustness of this relationship were followed eventually by stable and hegemonic levels of institutionalization. But these high levels of institutionalized dominance occur earlier, more reliably, and more stably when dominant identity groups were welded together by networks of influential agents than when those agents were absent. For example, without influentials present, DI control of 1413 agents at $t=500$ (59%) yielded an average of 1590 dominant activated (66% of the population) at $t=1000$. With influentials present, DI control of the same number of agents at $t=500$ yielded an average of 1923 (80%) at $t=1000$. Without dominant influentials present at $t=500$ hegemonic levels of institutionalization at $t=1000$ were achieved and maintained beginning with DI at $t=500$ of 77% (1788) of the landscape. With influentials at $t=500$ hegemonic levels of institutionalization at $t=1000$ were achieved and maintained earlier, with DI at $t=500$ of 68% (1632) of the landscape and without the severe instability prior to the achievement of hegemony exhibited in histories of landscapes that did not include 5% dominant influentials.



We interpret these findings as evidence of the critical importance of Gramscian “organic intellectuals” to the protection of hegemonic projects and their eventual institutionalization.

The decisive role of this kind of leadership in the achievement and stabilization of both dominance and hegemony is dramatically apparent if the results of this last experiment are displayed according to the median rather than the average outcome of DI at t=1000. This data, displayed in Figure 13, reveals a threshold effect operating powerfully and early. It indicates that with these dominant influentials present a majority of histories produced hegemonic levels of institutionalization from a base of dominance at t=500 of only 59% (1413).¹⁶



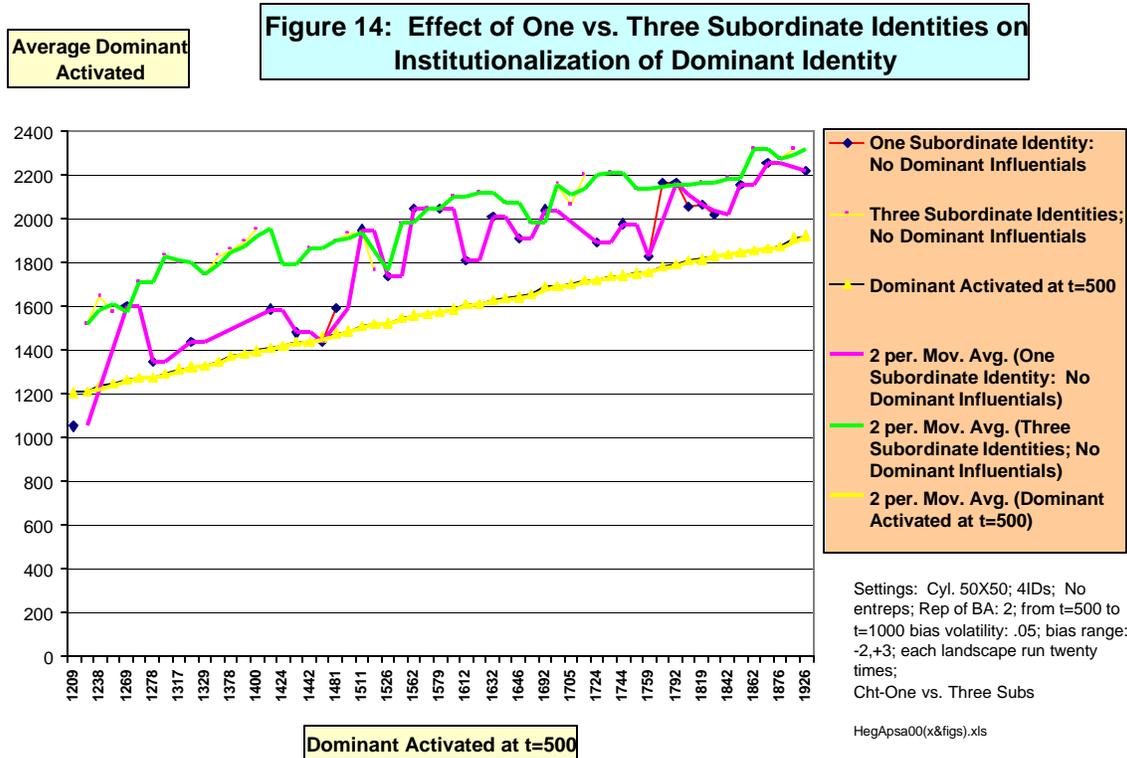
Having thus established the contribution that “organic intellectuals” can make to the institutionalization of a collective identity, we then faced the question of whether this same effect would occur if the dominant identity faced not one challenging subordinate identity, but three. Would the principle of “divide and rule” operate to enhance the hegemonizing effect of a network of dominant influentials? Alternatively, would the presence of different potential threats to the position of the dominant identity decrease the amount of success enjoyed by the dominant identity or increase the likelihood that one of these challenges would be successful? So far the evidence, based on our Phase 1 experiments, has suggested that even small increases in the number of alternatives (challenging identities expressed by at least ten percent of the population) substantially increases the likelihood of dominant identities losing their status as dominant to one of the subordinates.

Although we have not yet completed our work on this question by exposing landscapes with multiple alternative identities to dominant identities protected by influentials, we can compare the effect of three subordinate identities vs. one subordinate

identity and compare that to the effect of the presence of dominant influentials in landscapes where they face only one subordinate alternative.

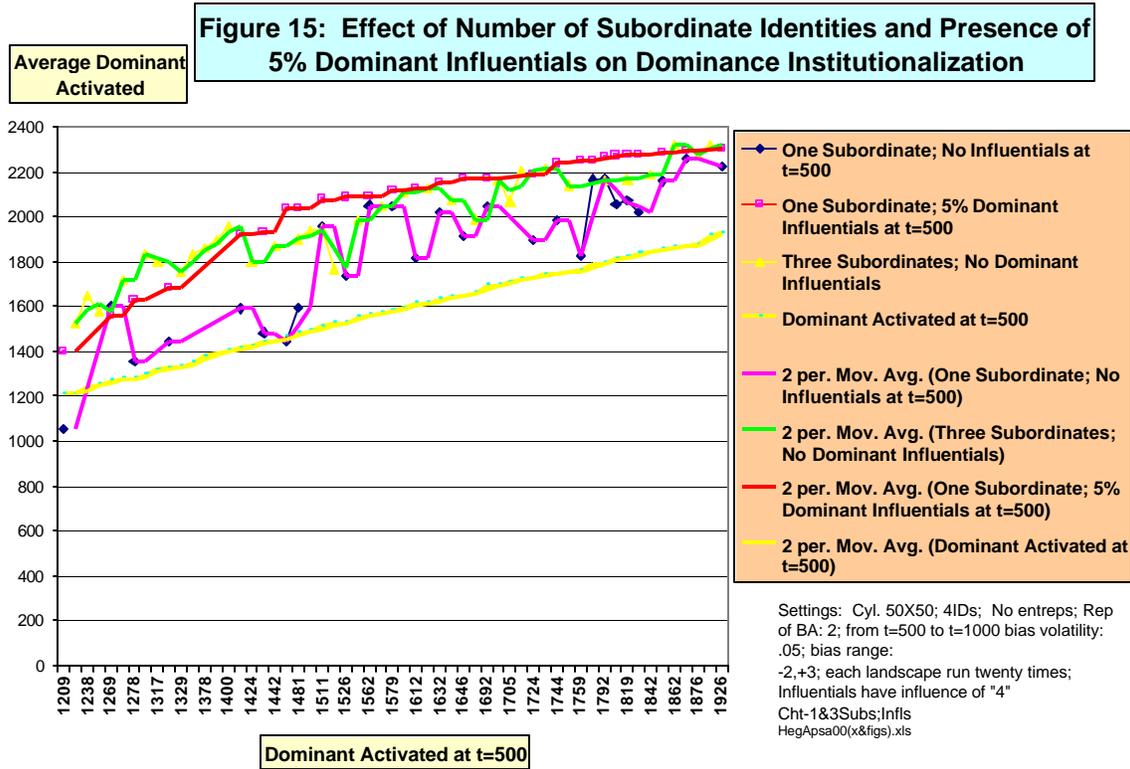
We proceeded as follows. A large number of landscapes with one dominant identity and three alternatives were produced using a variety of randomly seeded landscapes at $t=0$. Then a set of 43 landscapes at $t=500$, with dominant identities ranging from 1013 (42%) to 1917 (80%) were chosen for use in the experiment. Landscapes were selected which would together produce monotonically increasing values of DI at $t=500$. In order to control for relative sizes of subordinate identities we also rejected any landscape at $t=500$ in which the number of agents activated on the largest of the three alternative (subordinate) identities was more than twice as big as the number activated on the smallest.¹⁷ We then ran each of these 43 landscapes, featuring four contending identities, twenty times to $t=1000$ at stressful settings (bias volatility .05, bias range – 2,+3) and recorded the results.

In Figure 14 we compare moving averages for average DI's at $t=1000$ when the dominant identity confronts one subordinate alternative (violet line) vs. when it confronts three (green line). We note that when confronted with one subordinate identity the DI begins to achieve very high levels of dominance at $t=1000$ once it controls at least about 65% of the landscape at $t=500$ (1511), first reaches hegemonic status after controlling 75% of the landscape at $t=500$ (1788), and is able to reliably produce hegemonic status after controlling about 77% of the landscape at $t=500$ (1852).



By contrast, when confronted by three separate alternative identities instead of a united opposition, the dominant identity achieves higher levels of institutionalization from comparable positions at t=500. Thus the DI confronting three alternatives first achieves very high levels of dominance at t=1000 once it controls at least about 58% of the landscape at t=500 (1400). It first reaches and reliably produces hegemonic status after controlling 71% of the landscape at t=500 (1693). Particularly striking is that even with a bare majority of agents at t=500 the dominant identity experiences a significant average increase in its presence when its opposition is divided into three groups. When DI at t=500 is just over half the landscape it enjoys an average level of institutionalization at t=1000 of 63% (1523) when facing three contenders compared to an actual loss of its dominant status when facing only one--DI at t=1000 of 44% (1054). Indeed the average of all histories run in these two conditions, up to the beginning of the crystallization threshold for the one subordinate condition (DI =63% or 1511), is nineteen per cent higher (1803 vs. 1502) for the DI when it is faced with a divided opposition compared to when it is faced with a united opposition.

Figure 15 combines the display in Figure 13 with that in Figure 9 to permit comparison of the relative potency of 5% dominant influentials and the division of opposition into three alternatives as factors enhancing the institutionalization and hegemonic prospects of dominant identities.



The data in Figure 15 indicate that over the entire range of values for DI at t=500 tested DI's possessing a network of 5% influential agents came to control even larger proportions of their landscapes at t=1000 than DI's confronting a divided opposition. But in absolute terms this difference was relatively small compared to the advantages which either one of these conditions conferred when compared to DI institutionalization patterns in the absence of either one. We note in particular that DI's enjoying either a divided opposition or a network of organic intellectuals must wait for their institutionalization levels to rise until a threshold is crossed, as is the case for DI's lacking these conditions.¹⁸ We also observe that both a divided opposition and organic intellectuals achieve much greater rates of reliability in the reproduction and institutionalization of dominance than when neither of these conditions is present. Thus the standard deviation of all observations for DI's at t=1000 when neither dominant influentials nor a divided

opposition was present was 307.1. For the five percent dominant influential condition with one subordinate this measure was 243.9; and for the divided opposition it was 199.1.

Overall what we learned from Phase 2 of our experiments was that in a relatively simple landscape, or polity, populated by agents with two alternative identities drawn from an array of four possible identities:

- dominant identities do enjoy increasing returns to size, indicating an institutionalization effect;
- with the opposition to dominance concentrated in one, two, or three alternatives the institutionalization effect is expressed more strongly by the absolute growth of the dominant identity rather than by rates of survival as dominant;
- a crystallization or regime institutionalization threshold can be observed even in the absence of stressful conditions, and with low levels of initial advantage and is regularly observed under varying conditions;
- this “crystallization” threshold appears stronger when measuring median outcomes rather than average outcomes;
- hegemonic levels of institutionalization can be regularly observed, varying as to the point of their onset with the presence of hypothesized variables, though the hypothesized “second threshold” leading to hegemony was not observed;
- a network of influential agents can contribute strongly to the reliability of attainment of hegemonic levels of institutionalization;
- increasing the number of alternative identities confronting a dominant identity helps the dominant identity protect and expand its dominance, but only under conditions of environmental turbulence;

Conclusion

Struggles for hegemonic dominance are crucial realities of politics. We therefore need to understand how hegemonic institutions and beliefs develop; how they relate to broader processes of institutionalization; and how they may be consciously constructed by some agents, but unconsciously experienced by most others. We are not here advancing agent-based modeling as a technique for addressing consciousness related questions. We are, however, suggesting that the shadows of hegemonic processes postulated to occur at the psychological level can be systematically examined at the collective level. Here we have tried to develop and apply new techniques for accomplishing this task. We have used carefully designed virtual worlds to explore the plausibility of theories concerning the translation of individual experiences of consciousness into distinctive patterns of stabilization and change at the macro level.

The two phases of our work thus far have utilized somewhat different approaches to the problem of designing virtual experiments to focus on these relationships. In particular, landscapes were much more heterogeneous in Phase 1 than in Phase 2; repertoires of agents were larger in Phase 1 than in Phase 2; and stress settings were somewhat higher in Phase 1 than in Phase two. These different designs enabled us to ask somewhat different questions, but complicated the task of comparing results. On the other hand, the differences in experimental conditions also enabled us to have more confidence in the robustness of our findings when those findings revealed similar results.

The strongest overall result was that institutional effects can be observed in each kind of landscape, or polity. In both heterogeneous polities and in simpler collectivities early margins of dominance endowed those leading identities with a disproportionate likelihood of subsequently increasing their presence in the polity or maintaining their dominance. In this simple but fundamentally important sense we were able to demonstrate that patterns at the micro-level, of agents individually adapting to local settings featuring marginally more agents activated on one identity, would produce systematic effects at the macro-level (specific dominance patterns in multiple histories across the polity as a whole). Moreover we were able to show that these micro patterns were often translated into macro-effects via threshold mechanisms—dramatic increases in the likelihood of cascades toward dominance by the leading identity that helped leading

identities institutionalize their dominance. Having traversed these thresholds, dominant identities were shown to have enjoyed a much greater probability of resisting efforts by rival identities to reduce their control of political space or replace them as dominant identities.

It should be noted, however, that although increasing returns to size were observed in every experiment, threshold effects were not. The "crystallization threshold" appeared in Phase 1 experiments when we examined the effects of increasing size on the likelihood of a dominant identity surviving as dominant through a stressful period, but **not** when we examined the effects of increasing size on the amount of increase in the presence of that identity throughout the population. On the other hand, this threshold effect was observed in Phase 2 experiments when we examined the effects of increasing size on the amount of increase in the presence of that identity throughout the population, and **not** when measuring the likelihood of replacement.

Although more work is required on this problem, we interpret this finding as produced by the heterogeneity of the virtual worlds used in Phase 1 and the relative simplicity (in terms of the number of available identities across the population) in Phase 2. This factor seems especially pertinent in light of our findings in both phases that even small increases in the number of rivals have important consequences. In the heterogeneous political spaces of Phase 1 experiments, identities activated by a plurality of the population of only 36% enjoyed huge advantages over identities just a bit smaller in terms of the probability of being able to protect their dominant status. On the other hand, it did not help them significantly to increase their portion of the landscape beyond this point. In the simpler political spaces of Phase 2 experiments identities facing a divided opposition (3 challengers rather than 1) could expect to take over very large proportions of the political space. Nor would they have to fear that if they slipped below a particular threshold (in this case 63% of the landscape) they would suffer a dramatic decline in the proportion of the political space they could eventually expect to control.

But while we found crystallization thresholds in both Phases, and while we found hegemony in both sets of experiments, we did not find second (hegemonic) thresholds. What we found instead, in both sets of experiments, was that following steep increases in

institutionalization effects, further increases in the rate of increasing returns to size tended to be gradual. Still it bears emphasis that we did observe zones of hegemonic domination. Within these zones the institutionalization of an identity's dominant position emerged with a 90% certainty or was reflected in its control of an average of 90% of the political space across all its histories.

We also found strong support for our hypothesis that turbulence, or stressful environments, would give better chances to contain the spread of the dominant identity's control and give alternatives to the initially dominant identity better chances to replace that identity as dominant and. What we did not fully anticipate, however, was the extent to which these conditions also afford better opportunities for identities already established as dominant to take advantage of turbulent conditions to expand or strengthen their dominant status. Our experiments in both phases show that this logical possibility is at least a virtual reality.

While we did not conduct strictly controlled tests of hypotheses relating all three of Lustick's variables (gross discrepancies, alternative interpretations, and entrepreneurial leadership) to patterns of appearance and disappearance of hegemony, we did demonstrate the operationalizability of each one in an agent-based modeling environment and their relevance to patterns of institutionalization. As noted, "gross discrepancies" (operationalized by periods of high bias volatility and range that exposed all identities, including dominant identities, to relatively extreme negative biases) were shown to increase the vulnerability of dominant, though not hegemonic, identity projects as well as increase opportunities for non-dominant projects to replace dominant projects. As expected, this variable was seen to have an interaction effect with the presence of alternatives such that combining a small number of alternatives with gross discrepancies produced a dramatic increase in the likelihood that dominant identities would be replaced. In other words, together these conditions greatly weakened the prospects for defending the dominant, if not hegemonic status of a leading identity.

Lastly we found striking support for the Gramscian hypothesis that networks of "organic intellectuals" akin, Gramsci suggested, to foremen on the shop floor or Jesuits in the Catholic Church, could make a very significant contribution to the institutionalization

and maintenance of domination. In our work this domination is exercised by identities that otherwise would not have the substantive basis to survive assaults by rivals or the vicissitudes of a turbulent world.

At this stage of our work the development and refinement of definitions, operationalizations, manipulations, and experimental techniques are as important, if not more important, than the findings themselves. We were satisfied with our operationalization of turbulence via adjustment in the volatility and range of bias variation, but we need to do more work to know the conditions under which particular settings of these parameters should be considered "high," "low," etc. We believe the operationalization of "threshold" which we employed, while complex, was effective in helping us distinguish significant discontinuities from less dramatic shifts. On the other hand we are aware that work in other fields in which strict operational definitions of discontinuous effects have been necessary, could help us streamline our approach and make our coding rules for the identification of thresholds less arbitrary.

In addition to these tasks, subsequent work on the problem of hegemonic institutionalization, and on broader questions of modeling relationships between micro and macro aspects of any institutionalization or deinstitutionalization process, will require tightly controlled, well understood landscapes and manipulations in which interaction effects among all three variables said to be important can be parsed. We also look forward to exploring the specific effects on these processes of entrepreneurial leadership, of sizeable proportions of apathetic agents, and of variation in the overall size and shape of the political space which agents inhabit.

¹ Ernest Gellner, Nations and Nationalism (Ithaca: Cornell University Press, 1983).

² Gary R. Johnson, "The Architecture of Ethnic Identity," Politics and the Life Sciences, Vol. 16, no. 2 (September 1997) pp. 257-262.

³ Walker Connor, "Man is a R(N)ational Animal," in Ethnonationalism: The Quest for Understanding (Princeton: Princeton University Press, 1994) pp. 195-209; Anthony D. Smith, The Ethnic Origins of Nations (Oxford: Blackwell, 1986).

⁴ Suny used this phrase in a lecture at the Solomon Asch Center for Study of Ethnopolitical Conflict, June 1999. See Geoff Eley and Ronald Grigor Suny, "Introduction: From the Moment of Social History to the Work of Cultural Representation," in Becoming National: A Reader (New York: Oxford University Press, 1996) pp. 3-37.

⁵ For more elaborate discussions of hegemony as a distinctive form of collective belief see Ian S. Lustick, Unsettled States, Disputed Lands: Britain and Ireland, France and Algeria, Israel and the West Bank/Gaza (Ithaca: Cornell University Press, 1993) pp. 53-56; and Ian S. Lustick, "Hegemony and the Riddle of Nationalism," in Ethnic Conflict and International Politics in the Middle East, Leonard Binder, ed. (Gainesville: University of Florida Press, 1999) pp. 332-59.

⁶ For some examples of hegemonic analysis applied to collective identity see David D. Laitin, Hegemony and Culture: Politics and Religious Change among the Yoruba (Chicago: University of Chicago, 1986); Antonio Gramsci, "Notes on Italian History," in Selections from the Prison Notebooks, Quintin Hoare and Geoffrey Nowell Smith, eds. (New York: International Publishers, 1983) pp. 44-122; and Lustick, "The Riddle of Nationalism," op. cit..

⁷ Ian S. Lustick, "Agent-Based Modeling of Collective Identity: Testing Constructivist Theory," Journal of Artificial Societies and Social Simulations, Vol. 3, no. 1 (January 2000) <http://jasss.soc.surrey.ac.uk/3/1/1.html>

⁸ All our experiments can be replicated by downloading the ABIR program as an executable file from <http://www.polisci.upenn.edu/profileil.html>. A manual describing the operation of the model is also available at this site.

⁹ Our definition of institutionalization threshold implies that there is a maximum of three thresholds that could be observed in any institutionalization process. Since each threshold must represent a minimum of 30% of the variation in observations, 90% is a reasonable, if somewhat arbitrary, marker for hegemonic institutionalization.

¹⁰ Note that replacement need not, though usually is effected through the establishment of the alternative as the dominant identity.

¹¹ Again, an "alternative" identity is considered present in the landscape if it is expressed by at least ten per cent of all agents.

¹² We also ran a complete replication of this experiment in order to corroborate our findings.

¹³ The 37 landscapes used included 36 produced by arranging all 220 landscapes in order of the size of DI at $t=500$. We then chose every fifth landscape, supplemented by one landscape, with 1357 activated dominant, added in order to smooth out the curve of initial conditions.

¹⁴ The comparative roughness of this curve may be in part due to the fact that the data in Figure 9 were produced by averaging 40 runs per condition while the data in Figure 10 represents averages of 20 runs per condition.

¹⁵ Antonio Gramsci, Selections from the Prison Notebooks, Quintin Hoare and Geoffrey Nowell Smith, eds. (New York: International Publishers, 1983) p. 340.

¹⁶ In some respects the median is a preferable measure of the effect we are interested in since the 2400 maximum for DI at $t=1000$ (the size of the entire landscape) artificially depresses average values.

¹⁷ In contrast to previous Phase 2 experiments, in which the smallest DI's considered at t=500 included at least 50% of the population, in this experiment we also examined histories of landscapes featuring DI's which, at t=500, were as small as 42% of the population. In light of the consistently high values achieved at t=1000 by DI's at t=500 below 2000, we put a ceiling on the upper range of our t=500 landscapes.

¹⁸ It may be hypothesized, however, that such institutionalization thresholds exist, but at levels of initial DI institutionalization below the lowest observations in these experiments.