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• **ABSTRACT**

This paper analyzes the transformation of East Germany's R&D system in the unification period after 1989. East Germany's transformation process was more profound and rapid than those in the other formerly communist countries: the difference lay in the fact that it moved alongside a complete institutional model (the West German) which gave the process a clear direction. This paper briefly describes the transformation at an institutional level, but then focuses on a set of individual research organizations: the institutes of the old DDR Academy of Sciences. A constrained-choice model is used to explain the wide variety of transformation outcomes (dissolution or preservation). This analysis shows that the Academy's institutes were threatened to varying degrees by the turbulent changes in their environment; that various opportunities for strategic action were open to them; that they used these opportunities in different ways; and that these factors together can plausibly explain the outcomes of the transformation.

An Academy in Transition: Organizational Success and Failure in the Process of German Unification

Hans-Georg Wolf

Among the processes of institutional change which have been going on within the R&D systems of the formerly communist states in Europe, East Germany's transformation seems to have been the most rapid and profound. This paper presents some findings on this process of change, concentrating on the sub-sector of publicly financed, extra-university research.¹ The specific question it addresses is: how can one explain the results of the transformation of East Germany's research system on the level of individual research organizations? What factors determined the survival of some institutes and the dissolution of others? In particular, this paper will try to evaluate the importance of exogenous and endogenous factors in the transformation process:

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to what extent could the research organizations themselves, confronted with extraordinarily far-reaching changes in their environment, influence their own fate?²

These questions are interesting, first, because they correspond to a long-standing debate in organization theory about voluntaristic (strategic choice) and deterministic (environmental selection) explanations of organizational change.³ Within this debate, little attention has been paid to scientific institutes and the constraints and opportunities for strategic action specific to this kind of organization. And second, there is an empirical interest in answering these questions: although a considerable number of studies have treated the transformation of East Germany's R&D system, most of these have focused on changes at the micro-level of individual researchers, and in particular on the number of scientific personnel employed,⁴ while only a few have analyzed the transformation at the level of individual research organizations. Focusing on scientific organizations as corporate actors, this paper addresses an important but somewhat neglected aspect of the transformation. Adopting such an analytical perspective does not, however, mean ignoring the importance of the individual level. Certainly, it was individual actors within the institutes who tried to cope with the transformation process. Still, the dynamics at the organizational level deserve attention in their own right.

The analysis presented in this paper draws on the results of a more comprehensive research project aimed at identifying the decisive factors which explain the transformation of East German research institutes during the unification period.⁵ This study was based on qualitative and quantitative data collected by the author between 1990 and 1994. Most importantly, the material prepared by the institutes of the former DDR Academy of Sciences for evaluation by the West German Science Council and the Council's recommendations, have been analyzed in detail. Moreover, 80 interviews with (former) employees of the institutes and other important participants in the transformation process have been conducted. In the main (final) section of this paper, a constrained-choice model of organizational change will be used to answer the research questions. Before that, a brief general characterization of the transformation process will be given, and the paper's analytical framework presented.

East Germany's R&D Organizations in the Unification Period

The transformation of East Germany's R&D system differed from the changes going on in the other post-communist states due to the particular situation of the divided Germany, which allowed one part of the country to access the political and institutional system of the other. The R&D institutions in West Germany gave the process a clear — albeit not uncontested — direction, and it was predominantly West German actors who provided the administrative means necessary to organize a very fundamental rearrangement in a very short time. The two political decisions most crucial to the transformation of East Germany's extra-university research system were made in the summer of 1990, and were codified in the Unification Treaty signed by both German states. Firstly, the treaty made quite clear that the East German research institutions were to be adapted to the institutions of research promotion of the Western part: structural adaptation was to take place in East Germany, not in the West. Secondly, the West German Science Council was engaged to undertake a systematic evaluation of the East German research institutions, and to decide upon their further funding from public sources.

The Science Council (*Wissenschaftsrat*) — an advisory body made up of political officials and of scientists from various fields — had conducted evaluations of scientific institutes in West Germany before. However, to decide on the future of 130 East German research institutes was — in quality and quantity — an extraordinarily challenging task. To cope with it, the Council established an Evaluation Committee and nine expert groups (the majority of whose members came from West Germany, although professors from East Germany and from abroad took part in each group). The Council managed to complete the evaluation less than one year after unification, in the summer of 1991.⁶ The Council's recommendations laid the foundation for a new system of extra-university research in East Germany, which for the most part was established in 1991 and 1992. The bulk of the recommendations was implemented, even though many details of the decisions regarding newly-founded institutes deviated considerably from the Science Council's intentions.⁷

The most important institution of extra-university research in the German Democratic Republic (DDR) was the Academy of

Sciences (*Akademie der Wissenschaften*, abbreviated: *AdW*). In 1990, it comprised 60 autonomous research institutes, covering a broad range of basic and applied research topics in both the sciences and the humanities. When the unification went into effect (on 3 October 1990), the *AdW* as a whole was dissolved. On the basis of the Science Council's recommendations, the institutes of the academy were either dissolved or preserved. It is on the level of these individual laboratories that I will focus in this paper. First, I will show the surprisingly broad range of transformation outcomes; then I will discuss how these different results came about. In doing so, the fact that most of the Science Council's recommendations were implemented allows me to concentrate my analysis on the evaluation outcomes, instead of the actual reconstruction of research organizations.

To give an impression of the different transformation outcomes, let us look briefly at the case examples of two institutes, both members of the chemistry department of the *AdW*, both medium-sized and both located in Saxony. At the end of 1991, as a result of the evaluation, Institute 1 had almost entirely disappeared. The institute was dissolved, and only about 20 of its original 107 scientists were re-engaged at a state-financed research institution. Most of the former employees had to make do with temporary jobs, or became unemployed. Interviewees from the institute gave a bitter assessment of the institute's transformation. In their view, the institute itself had had no control whatsoever over its fate.

The transformation of Institute 2 ended completely differently. It was converted into a new extra-university laboratory jointly financed by the federal state and the *Land* of Saxony. Almost all the approximately 100 scientists of Institute 2 were taken over by the new institute. Interviewees from the institute commented positively on the transformation. They even expressed their hope that the new institute, by hiring new employees, might help to improve the situation in the local labour market.

Approximately 10% of the *AdW*'s 60 institutes were to be completely dissolved, like Institute 1; no significant share of their personnel was recommended for future funding (see Table 1). About 35% were to be converted into newly-founded laboratories, like Institute 2; they were to receive further funding as autonomous organizations. A further 47% were to be broken down into smaller units; to a varying degree, these subunits were to continue to receive public funds. Finally, 9% of the institutes were to be

TABLE 1
Evaluation Outcomes^a for the Institutes of the AdW

Organizational Fate →	Complete Dissolution	Disinte- gration	Integration	Conversion	Total ^b
Percentage of Personnel Taken ↓ Over or Kept On					
	% of all AdW institutes (n=60)				
Less than one third	10	3	2	3	18
One third to two thirds	0	37	5	20	62
More than two thirds	0	7	2	12	21
Total	10	47	9	35	100

Notes: ^a In this table and the four following, 'evaluation outcomes' refers to the recommendations given by the Science Council in 1991: see Wissenschaftsrat, *Stellungnahmen zu den außeruniversitären Forschungseinrichtungen in den neuen Ländern und in Berlin — Allgemeiner Teil: Charakteristika der Forschungssituation in der ehemaligen DDR und künftige Entwicklungsmöglichkeiten einzelner Fachgebiete* (Köln: Selbstverlag, 1992).

^b Because of rounding errors, the totals do not add up to 100.

completely integrated into existing West German research institutes.

The recommendations varied not only with regard to the dissolution or preservation of the institutes, but also with regard to the share of employees that were to be kept on in their institutes, or to be taken over by other research institutions. According to a rough estimation — many of the Science Council's recommendations are not detailed enough to allow for a more precise interpretation — in 18% of the institutes, less than one third of the employees were to be retained. Not surprisingly, this category includes all the completely dissolved institutes. But the same low percentage of retained personnel can also be found in two of the disintegrated, one of the integrated and two of the converted institutes. In the majority (62%) of the institutes, a more generous percentage of personnel was to be kept on: one fifth of the institutes managed to retain more than two-thirds of their personnel. Most of the cases in this category are converted institutes, but the group also includes four institutes which were to be split into smaller units, and one institute which was to be integrated into another research institution.

Obviously, the fate of an organization often diverged from the aggregated fate of its personnel. Some institutes were 'successful' as organizations — they survived as organizational units — while most of their employees lost their positions. Some other institutes completely lost their organizational integrity and were split up into various subunits. These subunits, however, were integrated into existing or newly-founded larger research organizations, and most of the institute's employees could continue their work. If both measures of the transformation outcome are considered, a very differentiated picture of what happened to the *AdW* institutes has to be drawn.

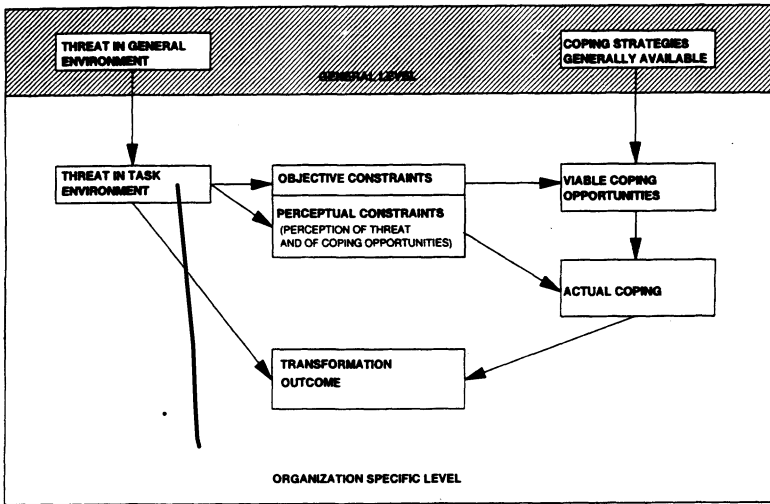
In the following attempt to identify the decisive factors in the process considered here, the transformation of the single institutes of the *AdW* will be analyzed using a *focal organization* approach.⁸ To cope with the complexity of the process, a constrained-choice model will be used,⁹ according to which the outcome of the transformation of an institute is determined by the interplay of four closely-related factors: the extent to which the environmental change posed an existential threat to an institute; opportunities for adaptive action by the institute; factors constraining its capacity to adapt; and the actual coping behaviour of the institute (see Figure 1 for a schematic representation of these interrelated factors). I do not claim that this analytical framework and the following discussion take into account each and every relevant aspect of the transformation process. I do hope, however, that the most important factors are included.

Crucial Factors of the Transformation

Threatening Changes in the General Environment and Task Environment

German unification entailed a very fundamental change in the general environment of all East German research institutes. Within a very short-time, both the legal framework for publicly-financed research and the governmental agencies controlling this sector were completely replaced. However, while there was a threatening change in the general environment of all institutes, the extent to which the task environment of the individual institutes also changed in a threatening way varied significantly.¹⁰ For many

FIGURE 1
A Model of Crucial Factors in Organizational Transformation



institutes, the threat specific to the narrower organizational environment appeared almost insuperable but, in others, it was almost harmless.

First, the environment of those institutes specializing in basic research changed in a different way from the environment of those in applied research. Different criteria were crucial to the evaluation of each category. In both categories, a certain minimum level of scientific quality was *conditio sine qua non* for a positive recommendation. What varied, however, was the importance of the (potential) *usefulness* of research. The usefulness of basic research is always uncertain and difficult to assess. Therefore it is not surprising that this criterion did not figure prominently in the Science Council's evaluation of East Germany's basic research institutes. However, in fields of applied research, the usefulness of a research programme played a significant role in the Science Council's considerations. Thus, compared to the basic research institutes, the applied research institutes had to meet an additional criterion. Moreover, the classification of applied research as more

TABLE 2
Evaluation Outcomes for *AdW* Institutes in Basic and Applied Research

Research Orientation ↓	No. abs.	Organizational Fate		Percentage of Personnel Taken Over or Kept On		
		Winding Up	Conversion	Less than 1/3	1/3 to 2/3	More than 2/3
		% of <i>AdW</i> institutes (n=45)				
Mainly basic research	8	50	50	25	50	25
Combination of basic and applied research	20	45	55	5	70	25
Mainly applied research	17	71	29	29	65	6
Total	45	56	44	18	64	18

or less useful depends very much on the economic and social circumstances. The profound change of these circumstances in East Germany after 1989 was thus particularly problematic for the institutes doing applied research.

As a result, on the aggregated level, these institutes fared worse than the average. Table 2 shows the different transformation outcomes for institutes specializing in basic or applied research, or doing a combination of both types.¹¹ The highest share of wound-up institutes belongs to the applied research category.¹² Thus, if success is identified with organizational survival, the applied research institutes were the least successful. They also fared most poorly with regard to the percentage of retained personnel. In only 6% of them could more than two-thirds of the personnel retain employment, as opposed to 25% of the institutes in both of the other categories.

Moreover, the transformation outcomes varied considerably between scientific disciplines (see Table 3), suggesting that there were corresponding differences in the extent of environmental threat. The threat was particularly strong for institutes in the social sciences and economics. All of these have been wound up, and a smaller share of personnel than in all other disciplines were taken over by other scientific institutions. Most of the chemistry institutes have also been wound up. On the other hand, the physics and biology institutes have quite often survived as organizations. With regard to the percentage of personnel recommended for further

TABLE 3
Evaluation Outcomes for AdW Institutes in Different Disciplines

Discipline ↓	No. abs.	Organizational Fate		Percentage of Personnel Taken Over or Kept On		
		Winding Up	Conversion	Less than 1/3	1/3 to 2/3	More than 2/3
		% of all AdW institutes (n=60)				
Biology/medical science	13	31	69	31	46	23
Chemistry	9	78	22	22	56	22
Humanities	8	88	13	0	63	38
Geography/cosmology	8	75	25	25	50	25
Mathematics/computer sciences	5	80	20	0	80	20
Physics	10	40	60	0	100	0
Economics/social sciences	7	100	0	43	43	14
Total	60	65	35	18	62	20

public funding, however, the biology institutes have fared even worse than the chemistry institutes.

The background to these disciplinary differences can be found in cognitive and organizational structures. The negative result in the social sciences and economics has come about partly because the cognitive content of research in these fields is noticeably influenced by the political system, and differed considerably between East and West Germany. Although most of the AdW institutes in these disciplines made major efforts to reform their research programmes after 1989, the Science Council did not see sufficient reason for continuing to fund these institutes. In justifying its recommendations, the Science Council not only pointed to the research programmes of the institutes but also to organizational considerations. According to the Council, the institutes lacked internal homogeneity and their kind of research belonged to the university sector. Thus the Council found it preferable to dissolve almost all of these institutes, and to transfer to East German universities those research groups which it considered valuable.¹³

In chemistry, the negative result — in terms of organizational survival — can be partly attributed to differences in the organizational structure of this discipline between the two Germanies. In

the East, a much higher percentage of chemistry research than in the West was done in extra-university, publicly-funded laboratories. In the *AdW*'s chemistry institutes, the Science Council found many activities which it considered to be part of the domain of industrial R&D, applying the standards of the West German institutional framework. In most cases, the Science Council did not recommend these activities for further public funding. Moreover, the Council aimed at transferring a high proportion of the *AdW* chemists to East German universities.¹⁴ Therefore, in chemistry (as in the social sciences) the Science Council opted for winding up almost all institutes.

Thus the environmental threat to the survival of the research institutes was particularly strong in the humanities, social sciences and chemistry. In these disciplines, therefore, the transformation outcomes at the organizational level were determined to a higher degree than in the other disciplines by exogenous factors, and there was less leeway for these institutes to cope successfully.

Finally, other differences in the strength of environmental threat were not related to entire classes of institutes, but to certain characteristics of individual organizations. To a large extent, whether or not an institute was seriously endangered was a question of 'structural fit'. It was crucial whether the evaluators considered an institute's particular fields of activity to be useful or promising, and whether or not its organizational form seemed to be compatible with the West German research system. In these respects, even institutes in the same discipline differed considerably. For instance, the decisive difference between the two chemistry institutes mentioned above seems to lie in the perceived demand for their research. Most of the research topics of Institute 1, the one which was closed, were determined to a great extent by the economic requirements of the DDR. The institute concentrated on optimizing methods for the exploitation of raw materials available on East German territory. In light of international developments in this particular scientific field, the Science Council saw no sufficient need for continuing this kind of research. Institute 2, the one whose transformation was successful, worked on applied polymer chemistry, which is considered a field of growing international importance. Thus German unification changed the external environment of Institute 1 *in a more menacing way* than was the case for Institute 2.

Another specific trait of an institute crucial to the evaluation

was, of course, its scientific quality. The Science Council stressed quality as the most important evaluative criterion. However, the definition and measurement of scientific quality, which is never easy, proved particularly difficult in this case. An evaluation of 60 laboratories, which the Science Council was forced to conduct in only nine months due to the general political circumstances, could hardly be very thorough.¹⁵ It is very likely, therefore, that in addition to the 'objective quality' (however this might be defined) other factors influenced the evaluation result. For instance, there is some indication from several expert interviews that institutes with a good scientific reputation were favoured.¹⁶ Of course, the evaluators did not simply use the reputation of an institute as a *substitute* for measuring its scientific quality. It is very likely, however, that they reduced the complexity of this measurement by taking into account (consciously or not) the institute's established reputation.¹⁷ To be sure, reputation depends on quality,¹⁸ but it cannot be completely reduced to it. Established connections to other important actors in the field could also make an institute less vulnerable. Conversely, those institutes with less of a reputation, and isolated from the scientific community in their field, were often very strongly affected by the environmental threat.

Coping Strategies Generally Available

Although, as demonstrated above, the institutes were threatened to varying degrees, none of them could afford to take a wait-and-see attitude. So the question is what opportunities for action remained — the second factor in my model. I want to discuss four organizational coping strategies which are in principle viable for research institutes, and which can enhance their survival chances in conditions of environmental change.¹⁹ These strategies have been derived from various approaches in organization studies. While they may not constitute an exhaustive list of strategic opportunities, they have proved to be pertinent in the cases considered here.

The first strategy is a rather defensive one which organizations frequently use in critical situations: trying to improve their efficiency. One important element in this strategy is to aim at a

better environmental fit by *size reduction*. To counter criticisms that they were overstaffed and inefficient, most *AdW* institutes reduced their personnel. From the summer of 1990 until September 1991, the number of employees at the *AdW*'s 60 institutes dropped by approximately 25%. However, I found no significant correlation between different rates of reduction and different organizational outcomes. The interrelation between these two variables appears to be more complex. Some institutes survived without having to make large reductions in personnel simply because *they* were never considered by the actors in their environment to be overstaffed. In another group of institutes, there was a rapid decline of personnel, but the Science Council nevertheless recommended that they be wound up. In many of these latter cases, the decline in personnel was not the result of a deliberate strategy of the organization, but simply came about because a large proportion of the researchers who did not believe in the survival of their organization sought and found employment elsewhere. Often, the most qualified researchers were the ones who left (because they most easily found other employment), thus impairing the future prospects of their institute — a self-fulfilling prophecy.

The second strategy can be labelled *coalition building* or *networking*.²⁰ The institutes had to find supporters among relevant actors — scientists, government officials, industrial firms — in their environment. They needed coalition partners — particularly partners of high standing, and with experience of West Germany's science policy. These partners could help in many ways: give advice on organizational strategies, arrange contacts with other important actors, try to lobby in favour of the institutes, and so on. Although there are no comprehensive data available on this point, it seems that network connections explain a significant proportion of the variance in organizational outcomes. For an *AdW* institute, the task of finding and occupying a stable niche within the R&D landscape of unified Germany could be greatly facilitated by support from influential West German actors. For instance, many of the newly-founded research institutions in East Germany would not have materialized (or at least not in the same form and size) without the consent and aid of leading West German scientists working in the same research field. One example is the foundation of a new chemistry institute of the Max Planck Society in East

Germany,²¹ which incorporated research groups from several *AdW* institutes. The Science Council recommended the foundation of this institute on the basis of a research programme proposal which had been worked out by *AdW* chemists in close collaboration with colleagues from the West German Max Planck institute working in the same field. By designing a specialization for the new institute which did not overlap too much with the activities of the already existing Max Planck institutes, a potential conflict of interests was avoided.

A third strategy can be called *niche selection*.²² Institutes could try to redefine their organizational goals in order to achieve a better fit with the West German system of scientific institutions. A number of institutes fared well in the transformation because they chose a suitable research niche. For instance, one institute managed to survive within the highly competitive field of semiconductor research by concentrating on a special combination of semiconductor materials not widely studied before.²³ The first chemistry institute I mentioned earlier (Institute 1) attempted a similar strategy. It began a reorientation of its activities, concentrating much more on environmental research. Unfortunately, however, the evaluators did not believe the institute capable of a successful reorientation because, in their opinion, it would have meant an obvious break in the institute's research tradition.

As this case demonstrates, the strategy of niche selection was difficult to use. In fact, it did not pay for most institutes: those which started a major reorientation of their research programme were worse off in the end than those which essentially continued the same activities. This finding applies not only to the organizational fate of the institutes, but also to the percentage of personnel recommended for further funding (see Table 4). This is consistent with a hypothesis known in organization research as the *liability of change*.²⁴ Changing an organization's principal activities is hazardous in so far as it devalues technical assets, skills and routines. Successful niche selection requires that the chosen activities remain within the reach of the organization's established competencies. For instance, the physics institute mentioned in the previous paragraph changed the particular object of its research but could still make use of its general know-how in semiconductor technology. To be sure, many of the institutes that chose a niche which overstrained their competencies did not act out of careless-

TABLE 4
Efforts at Reorientation and Evaluation Outcomes at AdW Institutes

Efforts at Reorientation ↓	No. abs.	Organizational Fate		Percentage of Personnel Taken Over or Kept On		
		Winding Up	Conversion	Less than 1/3	1/3 to 2/3	More than 2/3
		% of all AdW institutes (n=57)				
Major efforts made	23	78	22	30	70	0
No major efforts made	34	56	44	12	56	32
Total	57	65	35	19	61	19

Note: Three AdW institutes which were only founded in 1990 are not included here.

ness: rather, they were forced into this risky undertaking because it was evident to them that their survival prospects without a reorientation were even poorer, and that a more suitable niche did not exist.

Finally, institutes could use a strategy social psychologists call *impression management*.²⁵ The evaluators did not decide institutes' fates on the basis of completely objective information, but were also guided by the impression an institute had made on them. Institutes could try to influence this process of 'impression formation'. In their written material prepared for the Science Council, for instance, and on the occasion of the Council's on-site inspection, institutes had a chance to represent the quality of their scientific work, and the public demand for it, as positively as possible. This strategy is closely related to the other three strategies. Since the latter could be used in a very demonstrative manner, they could be supported by impression management. Efficacious impression management was particularly important for those institutes which did not (or could not) successfully apply the other strategies; unfortunately for them, however, it was also particularly hard for these institutes to put impression management into effect. Conversely, the task of impression management was facilitated if an institute had succeeded in improving its efficiency beforehand, had found a suitable niche or had secured the support of important coalition partners — but it was also less important in such a case.

Constraints on Adaptive Action and Viable Coping Opportunities

Although the adaptive strategies I have described were available, in theory, to all institutes, they did not all, in fact, have an equal chance to apply them successfully. In their coping efforts, institutes were constrained by various factors. Thus, in each institute's specific case, only some of the coping strategies which can generally be applied under conditions of environmental change were viable. There are two closely related categories of objective constraints on adaptive action: those originating in the organizational environment, and those originating within the organizations themselves.

First, the range of viable strategies was limited by the strength of the threat in an institute's task environment. For instance, a very far-reaching change could create an environment which, for some institutes, left no suitable niches at all (sufficient resources were available in the new environment for none of the research activities which the institutes could convincingly claim as their domain). Some of the social science institutes, for example, specialized so strongly in research determined by the communist form of society that it was very hard to imagine a niche they could occupy in a pluralist society. Thus, in certain conditions, the strategy of niche selection was not viable at all.

Second, institutes were constrained by specific organizational characteristics. During their history as research organizations, they had acquired certain routines, organizational cultures, corporate identities, specialized skills and technical equipment. In the transformation process, a smaller or larger part of this organizational software and hardware no longer fitted the new environmental conditions. Since not all of these properties could be changed at short notice, the organizational past limited the scope of future choices.²⁶ One example is the *AdW*'s institute of molecular biology. As the Science Council attested,²⁷ this institute had acquired good technical skills — but only in the classical methods of biochemistry. Partly because of the institute's isolation from the international scientific community, it lacked experience in modern techniques in molecular biology. This was one of the reasons for the Science Council's recommendation drastically to reduce the institute's personnel. The range of strategic opportuni-

ties for this institute would have been much larger if it had possessed more advanced technical skills.

Another constraint on adaptive action influenced by organizational history was the degree of dissent among an institute's employees, and between its subunits. Generally, the breadth and intensity of the political transformation created a high level of conflict, not only in East Germany's research institutions but in all social subsectors. Additionally, however, the institutes' specific organizational identities made some more (and others less) susceptible to conflict and divergent interests. Some institutes — in particular, many of the large 'central institutes' (*Zentralinstitute*) — had been, from their foundation, very heterogeneous conglomerates. In the transformation period, these institutes often found it difficult to pursue a consistent strategy. Other institutes were more capable of consistent collective action and could react more flexibly because, in their organizational past, they had developed into comparatively homogeneous communities.

Objective constraints reduced the set of generally available coping strategies to a smaller set of truly viable opportunities for each particular organization. In turn, this set of viable opportunities was seldom fully utilized by each organization's actual coping behaviour. Organizational action depended not only on objective factors, but also on the organization's perception of the situation. To react strategically to the environmental threat, institutes first had to assess that threat realistically and, moreover, they had to become fully aware of their strategic opportunities. German unification confronted the institutes with a completely different institutional environment: they had to learn much about this new environment, and about the constraints and opportunities it provided. Unfortunately, because of the fast pace of the unification process, there was little time to learn.

For example, when institutes tried to find out the organizational form in which they might be able to survive in a unified Germany, they were constrained by their limited knowledge of the West German R&D system. The biggest group of research organizations among the new institutes recommended by the Science Council was the *Blue List (Blaue Liste) Institutes*, a heterogeneous conglomerate of scientific organizations whose only common feature is their mode of funding (normally, the costs are shared equally between the federal state and the *Länder*). Among the

AdW institutes themselves, a strikingly small proportion aimed at being converted into a Blue List Institute. One reason for this is the simple fact that the Blue List Institutes were much less well-known and visible, as organizational forms, than the institutes of, for example, the Max Planck Society.

Thus, only some of the viable strategies were in fact given serious consideration by *AdW* institutes. But again, not every institute was equally constrained by perceptual limitations. In particular, established contacts with actors more familiar with the West German R&D system improved the position of an institute, since they could provide advice on suitable strategies. Thus, by successful networking, institutes could, in general, lower the constraints upon their coping opportunities. Hence these constraints were not, after all, fully exogenous factors.

Actual Coping Behaviour and Its Influence on the Transformation Outcome

To summarize, the coping behaviour exhibited by *AdW* institutes during the transformation period was influenced by their perception of the threat and of the need to adapt, by the coping strategies open to them, and by their perception of these (Figure 1). All these factors varied considerably from one institute to the next, as did the institutes' coping behaviour.

Some institutes were very proactive, making contacts with new partners, generating publicity for their work and searching for new fields of activity. Other institutes adopted a rather passive attitude, continuing their routine activities and waiting for other actors to take the initiative. The category to which a specific institute belonged depended not least on the commitment of its top management — that is, its director and its leading scientists. In many institutes, debates on internal reforms raised the question of whether or not changes in top management might improve the institute's future prospects. These were complicated discussions because, quite often, a conflict arose between the wish to replace long-standing directors because of their involvement with the political system of the DDR, and the perception that the institute needed experienced leaders at this critical time. During the transformation period, more than half the institutes decided to replace their directors. However, I found no correlation between

this variable and the decision to wind up, or to preserve, an institute. It is clear that, in the case of *AdW* institutes, managerial succession had no direct effect on organizational success.

What became of an institute and its personnel at the end of the transformation period was determined by the threat originating from changes in the task environment, and by the institute's actual coping behaviour. In other words, the transformation outcome depended on endogenous factors, which were related to the adaptive action of each particular organization, and on exogenous factors, which organizations could not change. The ratio of exogenous to endogenous determinants differed from one institute to the next, and is difficult to evaluate in aggregate. The following discussion is therefore based on rough estimations.

Regarding the *organizational survival* of the institutes, in most cases, exogenous factors seem to have predominated. In one large group of institutes (in the view of the actors deciding on their fate), German unification brought about such a serious structural misfit between organization and environment that the dissolution of the institutes was inevitable. This was particularly typical for the social sciences and economics, but many institutes in other disciplines (such as Institute I) faced the same situation. In a second, much smaller group, however, the institutes' fates were not clearly determined by exogenous factors. The change in the task environment was threatening but not insuperable. In these cases, each institute's coping behaviour had a significant influence on the transformation outcome. By judiciously applying the various coping strategies open to them, some institutes managed to secure their survival, while others missed that chance.²⁸ In a third, probably still smaller group, exogenous factors predominated, but determined the institute's fate in a favourable way. These were the 'lucky' institutes whose quality and/or usefulness was so uncontested that their organizational survival was not seriously threatened by the unification process. One example is the *AdW* institute specializing in research on the Sorbs, an ethnic minority in East Germany's Lausitz region. Almost without dispute, the activities of this institute were considered to be important and valuable, not only for scientific reasons but also within the context of cultural policy. This is the only institute in *AdW*'s humanities department which has been preserved as a publicly-financed research group.

In sum, endogenous factors were of crucial importance to *organizational survival* only in a minority of cases. However, they

TABLE 5
Preference for Preservation as Single Organization or Disintegration, and
Evaluation Outcomes of AdW Institutes

Preferences of the Institutes ↓	No. abs.	Organizational Fate		Percentage of Personnel Taken Over or Kept On		
		Winding Up	Conver- sion	Less than 1/3	1/3 to 2/3	More than 2/3
		% of all AdW institutes (n=60)				
Preference for preservation	44	57	43	25	55	20
Ambiguous position	6	67	33	0	100	0
Preference for disintegration	10	100	0	0	70	30
Total	60	65	35	18	62	20

proved much more important with regard to the *fate of the institutes' subunits and of their individual employees*. If an institute's dissolution could not be averted, there was still leeway for organizational action to improve the prospects of its constituent research departments. In fact, some institutes which did not survive as organizations but were successful in securing employment at other research institutions for a high percentage of their personnel had quite early on, deliberately stopped their efforts to ensure their survival as integrated organizations; instead, they concentrated on working out suitable solutions for their departments. Table 5 presents the evaluation outcomes for Adw institutes as a function of their preferences for their preservation or disintegration, as documented in the material they prepared for the Science Council. Ten institutes stated a preference for their dissolution and presented proposals for their disintegration into smaller units (another six institutes did not express an unequivocal preference for either preservation or dissolution). Not surprisingly, none of these ten was preserved. With regard to the proportion of personnel which the Science Council recommended for further public funding, however, this group clearly achieved the best result. Thus, oddly enough, if one looks at the process from the perspective of organizational subunits and individual organization members, 'organizational success' was in some cases achieved by 'organizational suicide'.

Conclusion

In this paper, I have tried to explain the transformation of the *AdW* institutes, using a constrained-choice model. From an organizational perspective, the German unification process produced strong exogenous constraints. Nevertheless, transformation outcomes were also significantly influenced by endogenous factors originating from strategic choices — that is, from coping efforts by the affected institutes. While institutes' activities were crucial to their survival or dissolution only in a minority of cases, these activities most frequently had a significant influence on the fate of single organizational subunits, and on the percentage of employees who could continue their work, either in the same institute or elsewhere. Although the specific combination of endogenous and exogenous factors varied from one institute to the next, some general differences in organizational outcome (between scientific disciplines and between institutes doing applied or basic research) can be seen.

In East Germany, the period of institutional reconstruction in the sector of extra-university, publicly-funded research is for the most part complete (notwithstanding some less important changes still going on). In some of the other post-communist countries, the same transformation process is still under way. Compared to these other countries, the specific German mode of transformation in this sector appears to have been more profound, more rapid and more clearly directed towards a specific institutional model.²⁹ It was West Germany that provided most of the administrative and financial resources for the reconstruction of East Germany's research institutions. *In this sense* one can indeed speak of a predominantly exogenous transformation, and *in this respect* the German case fundamentally differs from that in other post-communist states where societal transformation has been undertaken within unchanged national frontiers. It is too early to evaluate whether the German mode of transformation has been successful. Has it preserved the more productive research groups in Eastern Germany? Has it brought about a system of efficacious R&D institutions there? And, if so, at what economic and social cost? Regardless of how these questions may be answered, East Germany's extra-university R&D system seems to have an advantage over the systems of most other post-communist states: it has reached a comparatively stable state earlier.

• NOTES

I am very much indebted to the Editors of this Special Issue, and to two anonymous reviewers, for their kind and helpful comments on previous versions of this paper.

1. For a detailed study of the transformation in the extra-university sector, see Renate Mayntz, *Deutsche Forschung im Einigungsprozeß: Die Transformation der Akademie der Wissenschaften der DDR 1989 bis 1992* (Frankfurt-am-Main & New York: Campus, 1994). For the university sector, see Mayntz (ed.), *Aufbruch und Reform von oben. Ostdeutsche Universitäten im Transformationsprozess* (Frankfurt-am-Main & New York: Campus, 1994); Gunnar Berg (ed.), *Zur Situation der Universitäten und außeruniversitären Forschungseinrichtungen in den neuen Ländern*, Nova Acta Leopoldina-Abhandlungen der Deutschen Akademie der Naturforscher Leopoldina, Neue Folge, Vol. 71, No. 290 (Leipzig: Barth, 1994). The decline and reorganization process in East Germany's industrial research sector is analyzed in Anette Hilbert, *Industrieforschung in den neuen Bundesländern. Ausgangsbedingungen und Reorganisation* (Wiesbaden: Deutscher Universitäts-Verlag, 1994). Two annotated bibliographies give references to more literature on these topics: Peer Pasternack, *DDR-Wissenschaftsgeschichte & Umbau von Hochschule und Wissenschaft in Ostdeutschland. Bibliographie 1989–1993: Selbständige Veröffentlichungen incl. Graue Literatur* (Leipzig: Leipziger Universitätsverlag, 1994); Werner Gruhn, *Die Transformation des ostdeutschen Wissenschaftssystems im Übergang von der DDR zur Bundesrepublik Deutschland: Eine annotierte Bibliographie zum Zeitraum 1990/91* (Erlangen: Deutsche Gesellschaft für zeitgeschichtliche Fragen e. V., 1992).

2. From the single-organization perspective taken in this paper, it follows that an evaluation of the overall effects of the transformation is not intended. This paper will not deal with how well the transformation in general has functioned, nor to what extent general goals of science, economic or social policy have been achieved.

3. See, among others W. Graham Astley and Andrew H. Van de Ven, 'Central Perspectives and Debates in Organization Theory', *Administrative Science Quarterly*, Vol. 28 (1983), 245–73.

4. See, for example, Werner Meske, 'The Restructuring of the East German Research System — a Provisional Appraisal', *Science and Public Policy*, Vol. 20 (1993), 298–312.

5. Hans-Georg Wolf, *Organisationsschicksale im deutschen Vereinigungsprozeß. Die Entwicklungswege der Institute der DDR-Akademie der Wissenschaften* (unpublished PhD thesis, University of Bielefeld, 1995).

6. See Wilhelm Krull, 'What Happened to East German Research? Reflections on the Wissenschaftsrat's Attempt to Evaluate and Restructure Non-University Research Institutions in Eastern Germany', *World Affairs*, Vol. 154 (Summer 1991), 14–23.

7. How this largely successful implementation came about is analyzed by Mayntz, op. cit. note 1 (*Deutsche Forschung*), 212–61.

8. See James D. Thompson, *Organizations in Action: Social Science Bases of Administrative Theory* (New York: McGraw-Hill, 1967).

9. See Jon Elster, *Ulysses and the Sirens: Studies in Rationality and Irrationality* (Cambridge: Cambridge University Press, 1979), 113; Peter Franz, 'Der "Constrained-Choice"-Ansatz als gemeinsamer Nenner individualistischer Ansätze

in der Soziologie', *Kölner Zeitschrift für Soziologie und Sozialpsychologie*, Vol. 38 (1986), 32–54.

10. 'Task environment' denotes that part of the general environment of the organization 'potentially relevant to goal setting and goal attainment': see William R. Dill, 'Environment as an Influence on Managerial Autonomy', *Administrative Science Quarterly*, Vol. 2 (1958), 409–33, quote at 459.

11. Institutes have been assigned to these three categories using patent statistics and qualitative information given in the institutes' evaluation reports. Institutes in the social sciences and humanities are not considered, since the distinction between applied and basic research is particularly hard to make in these disciplines.

12. The term 'wound-up institutes' (in German: *abgewickelte Institute*) here combines all those laboratories which were either completely dissolved, disintegrated or integrated into other research institutions; see Table 1.

13. Wissenschaftsrat, *Stellungnahmen zu den außeruniversitären Forschungseinrichtungen der ehemaligen Akademie der Wissenschaften der DDR auf dem Gebiet der Wirtschafts- und Sozialwissenschaften* (Köln: Selbstverlag, 1992), 10–11.

14. Wissenschaftsrat, *Stellungnahmen zu den außeruniversitären Forschungseinrichtungen der ehemaligen Akademie der Wissenschaften der DDR auf dem Gebiet der Chemie* (Köln: Selbstverlag, 1992), 8, 119.

15. For a critical discussion of the Science Council's evaluation, see Albert Over and Christian Tkocz, *Außeruniversitäre Forschungseinrichtungen in den neuen Bundesländern: Zu den Empfehlungen des Wissenschaftsrates* (Kassel: Wissenschaftliches Zentrum für Berufs- und Hochschulforschung der Universität Gesamthochschule Kassel, Werkstattberichte, Vol. 43, 1993), esp. 48–50.

16. Before 1989, the visibility and reputation of AdW institutes beyond the confines of the DDR differed considerably. Some institutes (for example, in the field of high-energy physics) were very active in international scientific collaboration and, therefore, well-known in West Germany; while other institutes, albeit not necessarily worse in terms of scientific quality, worked more in isolation.

17. Luhmann has discussed in more detail how reputation reduces complexity within the science system: see Niklas Luhmann, 'Selbststeuerung der Wissenschaft', in Luhmann, *Soziologische Aufklärung: Aufsätze zur Theorie sozialer Systeme* (Köln & Opladen: Westdeutscher Verlag, 1970), 232–52.

18. See J. Baumert, J. Naumann and P.M. Roeder, 'Reputation — A Hard-Currency Medium of Interchange: A Structural Equation Approach', *Scientometrics*, Vol. 19 (1990), 397–408.

19. For a comprehensive discussion of the way in which research organizations deal with exogenous disturbances, see Uwe Schimank and Andreas Stucke (eds.), *Coping with Trouble: How Science Reacts to Political Disturbances of Research Conditions* (Frankfurt-am-Main: Campus Verlag; New York: St Martin's Press, 1994). Two contributions in this volume deal with the transformation of East Germany's R&D system: Renate Mayntz, 'Academy of Sciences in Crisis: A Case Study of a Fruitless Struggle for Survival', 163–88; and Hans-Georg Wolf, 'German Unification as a Steamroller? The Institutes of the Academy of Sciences of the GDR in the Period of Transformation', 189–232.

20. Interorganizational theory and the resource dependence approach have comprehensively dealt with this strategy: see, for instance, J. Leslie Metcalfe, 'Organizational Strategies and Interorganizational Networks', *Human Relations*,

Vol. 29 (1976), 327–43; Jeffrey Pfeffer and Gerald R. Salancik, *The External Control of Organizations: A Resource Dependence Perspective* (New York: Harper & Row, 1978).

21. The Max Planck Society is the most important German (originally West German) organization for the promotion of basic extra-university research.

22. For discussions of the same strategy (although labelled differently), see: John Child, 'Organizational Structure, Environment and Performance: The Role of Strategic Choice', *Sociology* Vol. 6 (1972), 1–22; William H. Starbuck, 'Organizations and Their Environments', in M.D. Dunnette (ed.), *Handbook of Industrial and Organizational Psychology* (Chicago, IL: Rand McNally, 1976), 1069–123; Robert H. Miles and Kim S. Cameron, *Coffin Nails and Corporate Strategies* (Englewood Cliffs, NJ: Prentice-Hall, 1982).

23. See Wolf, op. cit. note 19, 214–19.

24. Michael T. Hannan and John Freeman, 'Structural Inertia and Organizational Change', *American Sociological Review*, Vol. 29 (1984), 149–64.

25. See Erving Goffman, *The Presentation of Self in Everyday Life* (Harmondsworth, Middx: Penguin Books, 9th reprint, 1987); Dennis B. Bromley, *Reputation, Image and Impression Management* (Chichester, Hants.: John Wiley & Sons, 1993). The concept is at times also used in organization research, but seldom on the corporate level. One example is Kimberly D. Elsbach and Robert I. Sutton, 'Acquiring Organizational Legitimacy through Illegitimate Actions: A Marriage of Institutional and Impression Management Theories', *Academy of Management Journal*, Vol. 35 (1992), 699–738.

26. As becomes clear at this point, the factors which constrain the scope of adaptive action and the factors which determine the extent of threat overlap. Analytically, however, they can be separated.

27. Wissenschaftsrat, *Stellungnahmen zu den außeruniversitären Forschungseinrichtungen in der ehemaligen der DDR auf dem Gebiet der Biowissenschaften und der Medizin* (Köln: Selbstverlag, 1992), 14–17.

28. Case studies demonstrating both kinds of coping behaviour are presented in Wolf, op. cit. note 19.

29. That such a comparatively unambiguous institutional model was at hand was made possible by the mode of German unification — East Germany's accession to West Germany — and by the high degree of consensus among the relevant West German actors on the sectoral institutions. See Mayntz, op. cit. note 1 (*Deutsche Forschung*), 264; Tobias Robischon, Andreas Stucke, Jürgen Wasem and Hans-Georg Wolf, *Die politische Logik der deutschen Vereinigung und der Institutionen-transfer: Eine Untersuchung am Beispiel von Gesundheitswesen, Forschungssystem und Telekommunikation* (Köln: Max-Planck-Institut für Gesellschaftsforschung, MPIFG Discussion Paper 94/3, 1994).

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