Cognitive structural models of unemployment and employment

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Basing predictions on the concepts of a mental model and social representation, we use a network diagram technique, which is a graphical extension and a statistical development of Lunt's matrix method (Lunt, 1989, 1991), to elicit individual models of the causal factors affecting a person's prospects of unemployment (Expt 1) or employment (Expt 2). Such diagrams comprise both direct paths from a factor to the phenomenon and indirect paths in which the connection to it is via some other factor. As we expected, the representation of unemployment is politicized in a way the representation of employment is not. In both studies, individuals also rated the effectiveness of different actions, based on the diagrammed factors, to affect the target phenomenon. These ratings were best explained by the perceived strength of factor paths rather than simply by the number of paths emanating from that factor. Experiment 2 also showed that the relative importance of direct path strengths in predicting these ratings depended on the order of completing the diagram and rating tasks consistent with expectations derived from the theory of mental models. Finally, using factor analysis and item response theory we show that individual diagrams for employment can be conceptualized as deriving from a single consensual representation. We discuss a view of social representation consistent with these data.

Cognitive approaches to action suppose that individuals construct internal representations corresponding to the perceived structure of situations. Such mental models allow individuals to explore alternative courses of actions and to consider their relative merits (Craik, 1943; Johnson-Laird, 1983). However, ways to explore the connection between a person's mental model of some phenomenon and their actions with respect to it remain underdeveloped. Social psychological research, for instance, in seeking to understand how individuals construe certain social phenomena, such as unemployment, has focused on the nature of the mental model, the perceived causal structure, rather than ensuing action (e.g. Furnham, 1982, 1992; Heider, 1958; Kelley, 1983; Weiner, 1986). However, the notion of a social representation (as proposed by Moscovici, 1963, p. 251), for instance, emphasizes that they are shared representations constructed by a community of social agents for the purposes of behaving and communicating. In this context, such representations might be viewed as emerging in the course of talk (Antaki, 1985; Billig, 1993) or as reflecting stable cognitive structures (Moscovici, 1984). In either case, effective communication requires that the parties involved share a common understanding of the issue guiding

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their talk (Clark, 1996). We follow Sperber (1996) in believing that in order to establish a scientific basis for understanding such social representations we need to ground them in individual mental representations.

Researchers have sought to determine the nature of these representations either from spontaneous talk (Campbell & Muncer, 1987), semi-structured interview (Antaki, 1985) or via a matrix elicitation method (e.g. Lunt, 1989, 1991). Lunt (1989) examined the perceived causal structure of unemployment by requiring individuals to assess the causal connection between pairs of factors (e.g. government policy and education) presented in a matrix. A network diagram was then constructed from the aggregated data. Heaven (1994) used the same methodology to examine the perceived causal structure of poverty. Both studies suggested differences in the network of causes proposed by left-wing and right-wing voters. In a methodological critique, Muncer (1995) argued that the networks established by Heaven may not be valid representations since the differences within the left-wing groups were as great as those between left- and right-wing groups. Muncer's critique addresses the extent to which the established networks are in fact consensual. Muncer & Gillen (1997) point out that the way in which the network is constructed according to Lunt's method allows for the possibility that it may not be endorsed by any single individual. If so in what sense is the representation consensual? In an elegant comparison of different matrix methods (on the issue of loneliness, see Lunt, 1991), they conclude that the networks produced by Lunt's method may reflect 'an amalgam of different lay interpretations'. In their technique, each time a new causal path is added to the network, the entire network is checked for endorsement by each and every participant. The networks so constructed present a simpler, and arguably, consensual representation.

There is much to be said for their approach, but like Lunt's method it does not allow the possibility that causal connections may differ not only in terms of their presence or absence but also in terms of their strength. Individuals may agree not only that factors A and B can increase the likelihood of unemployment, say, but also that factor A has a stronger impact than factor B. A further problem with the matrix method as currently used is that the target factor, such as unemployment, is not itself listed as one of the factors in the matrix and so one cannot know whether or not the factors affected the target factor directly or only indirectly. In addition, there has been no attempt to link the nature of the diagram to the kinds of actions that individuals might take. Other research, in the area of health beliefs, for instance, has been concerned to establish the relationship between specific beliefs and the actions individuals will take (see, for instance, Ajzen, 1985, for a view of planned behaviour; Schwarzer, 1992, for a synoptic model; and Johnston, Conner, Abraham, Sheeran & Ingham, 1993, for an overview). However, such research has tended not to develop a rich picture of the belief structure.

Green & McManus (1995) aimed to contribute to the set of techniques that examine the link between mental representations and actions by requiring participants themselves to construct network diagrams. Network diagrams are a readily understood representational device and are frequently used by researchers to communicate the results of procedures designed to elicit knowledge (e.g. Hoc, 1989) or, as we have seen, to reveal perceived causal structure (e.g. Lunt, 1989). Green &

McManus provided participants with the opportunity to use such a device directly. Individual participants each drew a diagram to indicate the connections of various risk factors and the target factor, coronary heart disease, and then rated the effectiveness of different preventive actions based on these risk factors. In this study, a factor such as eating fatty foods could have a direct path to the target factor, or an indirect path (e.g. via blood cholesterol) or both a direct and an indirect path. In addition, individuals estimated for each path in their diagram its relative causal strength on a scale. They termed the diagrams cognitive structural models. Green & McManus showed that total path strengths (the sum of both direct and indirect path strengths) accounted for two-thirds of the variance in the ratings of different preventive actions.

One of the aims of the two studies reported here was to achieve some measure of generality of this technique by examining the causal beliefs about a social phenomenon. The first study examined individual's perceptions of the causal relations among various putative factors that might affect the prospect of unemployment. The second study examined perceptions of the factors affecting a person's prospects of employment.

Early studies on unemployment (see Furnham, 1982) concentrated on the psychological impact of unemployment rather than on lay explanations, or attributions, of the causes of unemployment. In contrast, Furnham (1982) presented individuals with 20 commonly offered explanations of unemployment and required these to be rated on a scale of importance. Conservative voters perceived individualistic/internal causes of unemployment (e.g. lack of effort, poor education) as more important than external/societal explanations (e.g. incompetent management, policies of the present government). The reverse pattern obtained for Labour voters. Such results are consistent with the idea that different attributions are consequent on different social representations (Jaspers & Fraser, 1984; Moscovici, 1984) held by the different groups.

Lunt (1989) required individuals to assess the causal relationship between pairs of factors derived from Furnham's work in order to determine their perceived causal structure. Conservative Party voters perceived the causal flow as proceeding from internal to external causes, whereas Labour Party voters showed the opposite pattern. They also perceived external causes as more richly connected than Conservative Party voters. Alliance Party voters (Liberal Democrats) also viewed external causes as influencing internal causes but did not envisage a more complex structure for these. Unfortunately, as noted above, the diagrams produced from the aggregated data do not indicate where the target factor of unemployment lies within the network.

Experiment 1 uses the same factors as the earlier study by Lunt (1989) but required individuals to construct diagrams of the causal interconnections as they perceived them to be (i.e. they were not required to consider all possible relations as in the matrix method) and also to rate the strengths of each of the paths in the diagram. We anticipated that political affiliation might continue to be relevant in the presence of continued widespread unemployment in the UK—the representation should be politicized. In addition, our aim was to determine the relationship between an individual's diagram and his or her perception of the effectiveness of different actions

designed to affect the phenomenon of unemployment. Green & MacManus (1995) determined for each factor in the diagram its total path strength (the sum of the direct path strength and that of any indirect paths) and correlated, for each participant, these strength values with their ratings of the effectiveness of related actions. In Expt 1, in addition to computing total path strength, we also compute the direct path strengths alone and the total number of paths emanating from each factor ignoring their strength. If the perceived strength of a causal path is important then the former measures should correlate significantly more highly with the ratings of effectiveness than the measure based solely on the number of paths.

Given that individuals perceive themselves as members of different groups, which group is salient for them when considering a problem may depend upon how a problem is described. Work by Tversky & Kahneman (1981; see also Legrenzi, Girotto & Johnson-Laird, 1993) indicates that decisions about a problem depend on how the problem is described or framed. Although unemployment as a verbal concept refers to the absence of employment, i.e. is the antonym of employment, we supposed that the representation of unemployment might differ from that for employment by more than a change in the sign (negative to positive) on the paths in the diagram. Being required to consider the factors that affect a person's prospects of employment may lead individuals to associate themselves with the group of people seeking employment. The representations elicited may be less affected by party political affiliation. Taken together then, Experiments 1 and 2 explore the role of framing on the social representation of work.

In Expt 2, we examine two further questions of methodological and theoretical interest. The first of these is the extent to which the relationship between the diagrams and the rated effectiveness of different actions is affected by the order in which these two tasks are completed. In Expt 1, as in Green & McManus (1995), individuals draw their diagrams before completing the rating task. The act of constructing the diagram may lead individuals to consider explicitly certain paths that are normally latent or implicit. Certain kinds of talk or discussion might also have this effect as individuals explore or to seek to explain certain beliefs. The notion that individuals may normally seek to minimize what is explicitly represented mentally accords with a specific theory of mental models proposed by Johnson-Laird & Byrne (1991). The paths most likely to be affected are the indirect paths. In consequence, the total path strength (the sum of both direct and indirect paths) might reasonably be more highly correlated with the ratings of the effectiveness of actions (based on the factors represented in the diagram) than the direct path strength alone. However, when individuals complete the ratings task *before* the diagram task the reverse result might be expected. Individuals might base their ratings more on the direct paths. In consequence, the correlation of direct path strengths alone with the ratings of effectiveness might be higher than that for the total path strength and these ratings. The second study therefore varied the order of completing the tasks in order to test this conjecture. The sensitivity of this manipulation depends of course on the extent to which indirect paths play a significant role in the context of assessing a person's prospects of employment.

Our final question concerns the nature of the composite representation that we can construct from the individual diagrams. As noted above, one definition of a social

representation considers them as consensual or shared beliefs (e.g. Jaspers & Fraser, 1984). One can ask about the extent to which such a representation really is shared and hence is a 'social' representation. We described earlier a possible procedural solution to this problem proposed by Muncer & Gillen (1997, see also Gillen & Muncer, 1995, Muncer & Gillen, 1992). Given the larger samples size available to us in Expt 2 we sought to address the question of the consensual or social nature of the representation of the employment in a different way by determining statistically (using factor analysis and item response theory) whether or not individual diagrams could be seen as deriving from a common representation.

EXPERIMENT 1
Method

Participants

Sixty applicants for places on the undergraduate programme in psychology at University College London participated. Forty-nine completed the task satisfactorily; the remaining 11 either failed to label all paths with an indication of direction or failed to give a numerical estimate of strength for each of the paths.

Design

All individuals completed the diagram task before the rating task.

Procedure and materials

Individuals were run in a single group. They were told that we were interested in their perceptions of the phenomena, and it was stressed in advance that the study was anonymous and that the task played no role in determining the offer of a place. In fact, the task was one of a number illustrating ongoing work in the department. Participants were debriefed after the study.

Individuals were asked to draw a diagram indicating how, in their view, a set of factors caused unemployment. They were instructed as follows:

> People give a number of causes or factors as explanations of unemployment. Your task is to diagram how these various factors (listed below) are inter-related and affect unemployment in your view. For example, is it possible that a lack of effort by unemployed people makes them less willing to move for work? Do you think that government policies affect the amount of automation? Does automation affect the amount of unemployment? Please indicate the direction of the effect of one factor on another using an arrowed line and label the effect from the set of relations listed below:

Factors The names of the 12 factors to be diagrammed are in italic with a short description in brackets where necessary: *social security money* (unemployed people earn more on social security); *lack of effort; unwilling to move; lack of intelligence; poor education; weak trade unions* (unions do not fight to keep jobs); *incompetent management* (incompetent industrial management with poor planning); *automation; recession* (world-wide recession); *present government* (policies and strategies of present government); *previous government* (policies and strategies of previous government); *bad luck*. NB. Please indicate the connection of these factors (which can be either direct or indirect) to *unemployment* by including *unemployment* in your diagram.

Relations Makes worse; makes better; no relation.

A schematic overhead slide, which bore no factor names, was presented as an example. After five minutes participants were asked to check that they had represented each factor and labelled each path.

They were then asked to assess the strength of the paths connecting one factor to another by choosing a number between 0 and 100 where 0 means no relation (purely random) and 100 means an invariable relation. An example was proposed in order to clarify: 'So, for instance, when water boils at 100 degrees C, steam comes off. There is an invariable relation between the two'.

For each path, participants were asked to write down one number indicating the strength of the relation. Having completed this task, participants were asked to turn over the page and to complete the rating task. The instructions for the rating task were as follows:

> Imagine you were asked to advise on what actions to take to reduce unemployment. Please ring *one* number on the effectiveness scale for each action to indicate how effective you think it would be in reducing unemployment. 0 means totally ineffective and 10 means completely effective. Also please ring *one* number on the difficulty scale to indicate how difficult it would be in your view to carry out that action. On this scale 0 means not at all difficult and 10 extremely difficult.

Ten actions were listed that related to the factors previously diagrammed (bad luck and previous government policy were omitted). An effectiveness and difficulty scale were associated with each one. The 10 actions were: reduce social security payments; encourage greater effort to find work; encourage people to move to work; improve education of the unemployed; encourage the unemployed to act more intelligently; increase the power of the trade unions; resist the introduction of automation; encourage world-wide economic growth; improve management skills; alter policies of present government. Finally they were asked:

> If you were to vote in the next general election would you vote Conservative (C); Labour (L); Liberal Democrat (LD); Other (O). Please tick one.

Results and discussion

The results are organized in the following fashion: we first present a composite of the network diagrams generated by the participants; we then discuss the relationship between path strength and the ratings task; and then explore party political differences in network diagrams and the effectiveness ratings.

Cognitive structural model of unemployment

The 49 participants included an average of 14.3 paths in their diagram (SD = 3.3; range 8 to 25). A composite diagram was prepared by examining each separate path between any pair of factors for each participant and including paths represented by at least 10 per cent of them. Table 1 displays the numerical data (indicating a path by stating the factor from which it emanates (source factor) to the factor it targets (the target factor). Figure 1 shows the composite diagram or cognitive structural model. The different proportions of individuals (10–39, 40–69, 70–100 per cent) including a particular path are shown by different types of line. The average *strength* of each represented path is represented by lines of different thicknesses.

Cognitive structural models and ratings of effectiveness

In order to examine the relationship between the diagrams and the rated effectiveness of actions, we first calculated the total path strength of each factor to the target phenomenon. Suppose there is a direct path from factor A to the target and an indirect path via factor B. The total path strength is the strength of the direct path, and the strength of the indirect path. The strength of the indirect path is the strength
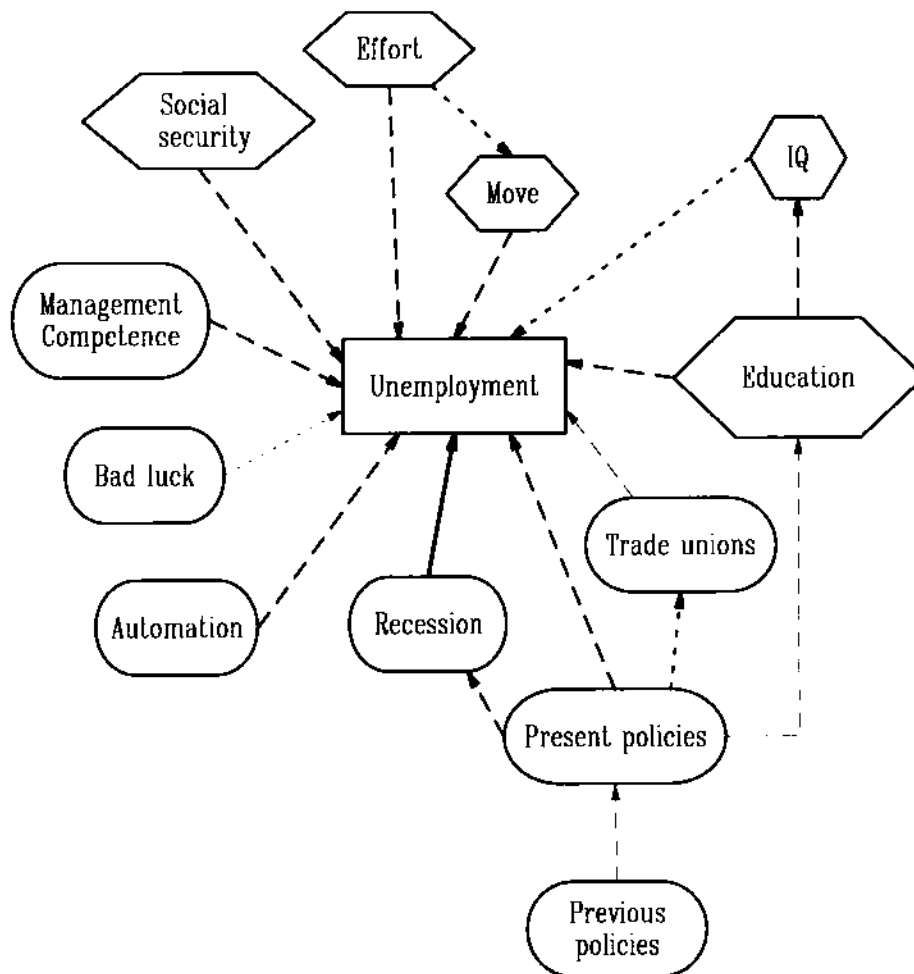
Figure 1. The composite diagram for unemployment for paths included by 10 per cent or more of the sample in Expt 1. All paths have a negative sign (see text for explanation). Key: , high proportion, thick strength; — — —, medium proportion and strength; ..., low proportion, normal strength; ◯, internal factor; ◯, external factor.

of the path from A to B (call this 20 per cent or 0.2) times the strength of the path from B to the target (call this 30 per cent or 0.3). In this it is 0.06 (0.2 times 0.3). If the strength of the direct path from A to the target is 0.4 (40 per cent or 0.4) then the total path strength is 0.46 (0.4 + 0.06) and so on for any more complex set of paths between any two factors. In particular, in every situation referred to in this paper, the total path strength is from a factor to the target phenomenon. Next, we recorded for each participant their ratings for each of the 10 different factors of how effective a change in each one would be in altering the prospects of unemployment, and of how difficult that change would be to achieve (two factors as noted in the Method section

Table 1. Paths and mean path strengths represented by more than 10 per cent of 49 participants in Expt 1

Source factor	Target factor	Number (%) representing the path	Mean path strength (SD)
Social security payments	Unemployment	21 (43)	44.05 (34.66)
	Lack of effort	28 (57)	48.21 (24.43)
Lack of effort	Unemployment	32 (60)	52.50 (23.42)
	Unwilling to move	16 (33)	45.00 (25.56)
Unwilling to move	Unemployment	24 (49)	40.42 (24.45)
Poor education	Unemployment	20 (41)	53.50 (23.90)
	Lack of intelligence	27 (55)	62.96 (26.47)
Lack of intelligence	Unemployment	18 (37)	42.50 (24.39)
Weak trade unions	Unemployment	29 (59)	38.28 (21.52)
Automation	Unemployment	33 (67)	55.00 (23.39)
World-wide recession	Unemployment	39 (80)	79.10 (17.35)
Poor management	Unemployment	30 (61)	51.67 (23.32)
Policies of the present government	Unemployment	20 (418)	64.75 (25.88)
	Education	20 (41)	58.50 (28.52)
	Trade unions	15 (31)	61.67 (25.47)
	World-wide recession	31 (63)	60.81 (29.04)
Policies of the previous government	Policies of the present government	21 (43)	34.52 (28.50)
Bad luck	Unemployment	15 (31)	35.33 (22.40)

were excluded, bad luck and policies of the previous government, as neither is open to effective change). Table 2 shows the mean (SD) rating of each factor for effectiveness and difficulty.

We then calculated, *separately for each individual*, the correlation between each of the 10 factors' total path strength and those same factors' ratings of effectiveness, using a conventional Pearson correlation r. Such correlations can be used to calculate descriptive statistics, or can be used as the dependent variables for comparing different individuals or comparing the same individuals in different conditions, using analysis of variance. In the present experiment, the mean correlation across individuals, r_m (i.e. the mean of a set of r correlations), was 0.47 (SD = 0.31, N = 49), which was highly significantly different from zero. This correlation is also significantly higher on a paired t test ($t(48) = 2.56$, $p < .025$) than the correlation

Table 2. Rated effectiveness and difficulty of different internal and external factors in affecting a person's prospects of unemployment in Expt 1

Factor	Type	Rated effectiveness (0 = totally ineffective, 10 = completely effective) Mean (SD)	Rated difficulty (0 = not at all difficult, 10 = extremely difficult) Mean (SD)
Reduce social security payments	Internal	4.45 (2.89)	6.17 (3.33)
Increase effort to find work	Internal	5.06 (2.81)	5.78 (2.81)
Encourage people to move to work	Internal	4.24 (2.13)	7.51 (2.15)
Improve education of the unemployed	Internal	7.27 (2.32)	6.16 (2.23)
Encourage unemployed to act more intelligently	Internal	3.35 (2.75)	7.11 (2.99)
Increase power of trade unions	External	5.06 (2.54)	4.88 (2.32)
Resist introduction of automation	External	5.50 (2.90)	7.13 (2.51)
Encourage world-wide economic growth	External	8.20 (1.67)	7.76 (2.55)
Improve management skills	External	7.12 (1.54)	5.63 (1.92)
Alter policies of present government	External	7.22 (2.10)	7.02 (2.32)

between these ratings and the direct path strengths alone (0.39, SD = 0.32, N = 49). These correlations in turn are significantly greater ($p < .001$, in both cases) than the correlation between the number of paths emanating from a factor, and the rated effectiveness of an action. The mean correlation between number of paths and effectiveness was 0.02 (SD = 0.25, N = 49), which is not significantly different from

zero. In contrast to the significant correlations between path strengths and the ratings of effectiveness, those with rated difficulty were not significant when appropriately analysed.

To summarize, the present study generalizes prior research by Green & McManus (1995) by confirming in a different domain that the total path strengths of factors in the diagram are significantly correlated with the rated effectiveness of different actions. It extends prior research by showing that the total path strengths add considerably more than just the direct paths, increasing the variance explained in the effectiveness ratings from 14.9 per cent with the direct paths alone, to 22.4 per cent with the total paths, an increase of 50 per cent or half as much again. Just considering the number of paths emanating from a factor fails to predict the effectiveness ratings at all. We turn now to our second question.

Party political differences in perceived causal structure and in the ratings of effectiveness and difficulty

As expected, party political affiliation affected the representation of paths in the diagram. We concentrated on those individuals stating that they would vote for one of the three main UK parties. Besides performing a global test as a function of political party we also computed a set of *a priori* contrasts, coding political parties according to their degree of 'leftedness'. We coded -1 for Conservative, 0 for Liberal Democrats and $+1$ for Labour. In line with the expectation that left-wing individuals would emphasize the causal relevance of external factors to unemployment, we found that the mean number paths emanating from external factors increased as a function of 'leftedness'. The relevant mean (SD) values were: Conservative voters, $N = 12$, 5.58 (2.78); Liberal Democrat voters, $N = 14$, 7.29 (2.37) and Labour voters, $N = 14$, 7.43 (1.87). The overall F test was $F(2,37) = 2.42$, $p = .051$ and that for the linear trend was $F(1,37) = 3.83$), $p < .05$ (one-tailed test). It could be that the Labour Party voters simply included more paths in their model, but there was no party political effect on internal factors ($F < 1$). The respective mean values were: -5.67 (1.07); 5.14 (2.25); 6.21 (2.33). However, some caution is needed in interpreting these results since there was no overall interaction between type of factor and political affiliation ($F(2,37) = 1.83$, n.s.).

We also looked for party political differences in the inclusion of paths in the models, individually for each of the internal and external factors. In view of the number of comparisons we set alpha at .01. Two specific paths were sensitive to political affiliation, one internal and one external. Labour Party voters were less likely to consider a lack of effort as causally relevant to a person's prospects of unemployment. The path from this factor to unemployment was included in the diagram by 36 per cent (5/14) of Labour Party voters, compared with 83 per cent (10/12) of Conservative Party voters and 79 per cent (11/14) of Liberal Democrat voters (Kendall's tau C $= -.43$, $p < .01$). Labour Party voters were less likely to assign any role to government policy (the Conservative Party was in power at the time) in affecting global recession: 83 per cent (10/12) of Conservative voters and 79 per cent (11/14) of Liberal Democrat voters included a path between government policy and recession compared with 36 per cent (5/14) of Labour Party voters

(Kendall's tau $C = -.43$, $p < .01$). Labour Party voters were seemingly less willing to attribute any causal role to a Conservative Government in affecting the global economy. Both these effects are consistent with what might be expected.

In terms of the effect of party political affiliation on actions, we expected that more right-wing voters would rate internal/individualistic factors as more effective compared to more left-wing voters (see Table 2). In contrast, left-wing voters would rate external/societal factors as more critical. In view of there being 10 separate factors, and in order to avoid inflating Type I errors, we used an alpha level of .01. On this basis, only two actions (one relating to an internal factor and one relating to an external factor) were sensitive to political allegiance but the direction of these effects is in line with expectation. Party affiliation significantly affected the rated effectiveness of *reducing social security payments* $(F(2,37) = 6.18, p < .01)$ with effectiveness ratings decreasing as a function of leftedness $(F(1,37) = 12.31, p < .01)$. Reducing social security payments was considered ineffective by Labour Party supporters but effective by Conservative Party supporters. The mean ratings with standard deviations in parentheses in order of increasing leftedness were: -6.25 (2.34); 4.57 (3.06); 2.50 (2.68). In contrast, changing the policy of the present government, was considered a more effective action by Labour Party supporters than by Conservative Party supporters $(F(2,37) = 3.74, p < .05)$. The mean ratings were 6.00 (2.17), 7.00 (2.08) and 8.12 (1.97), yielding a significant linear trend $(F(1,37) = 7.46, p < .01)$. There were no significant effects of political party affiliation on the difficulty ratings.

In short, these data provide some evidence that the representation of unemployment is politicized. The next experiment explores the representation of employment.

EXPERIMENT 2

In this experiment individuals were presented with eight factors (four internal and four external) derived from Expt 1 and diagrammed how these factors might affect a person's prospects of employment. According to our suppositions, the representation of employment might be less politicized. In addition, by varying the order in which individuals completed the diagram task and the rating task we hoped to examine the conjecture that the explicit representation of connections between factors affects the relative importance of indirect path strengths in predicting the rated effectiveness of actions. Finally, we examined the extent to which a single representation underlies the diagrams of different individuals; since the sample size in Expt 2 was substantially larger than that in Expt 1, we felt that we had sufficient statistical power to demonstrate convincingly the presence of one or more underlying factors.

Method

Participants

Participants were 107 applicants for places in the Psychology Department, University College London run in two groups. Ninety-two completed the tasks satisfactorily for analysis (citing all factors, providing path strengths and path directions for the indicated paths), 53 in the network diagram first condition and 39 in the rating task first condition.

Design

The order of completing the network diagram task and the rating task was varied between participants. In addition, the sequential order of the rating task questions were varied over participants.

Procedure and materials

The instructions and materials were suitably modified from Expt 1. For the diagram task individuals were required to diagram how each of eight factors affected an individual's prospect of being employed. The eight factors were defined as below:

Factor names	Interpretation
Increased effort	More effort by the individual to find work
Willing to move	Individual will relocate for work
Education	Having a good education and training
High IQ	Individual had high intelligence
Strong trade unions	Able to fight for jobs
Economic growth	World-wide economic growth
Competent management	Opposite to incompetent management
Government policy	Present government policy

The instructions for the rating tasks required individuals to rate the effectiveness of different actions to improve a person's prospects of being employed and to rate the difficulty of each of these actions. The eight actions were described as follows: increase their effort to find work, encourage the person to move to work, improve their education, act more intelligently, increase the power of the trade unions, encourage world-wide economic growth, improve management skills, change government policies.

Finally, in the same way as Expt 1, participants were asked for their party political affiliation.

Results and discussion

Cognitive structural model of employment

The 92 participants included an average of 14.1 paths in their diagrams (SD = 3.96; range 8 to 28). Table 3 presents information on the paths represented by more than 10 per cent of our sample and Fig. 2 displays the same information graphically. Both the percentage of individuals representing a path and the mean rated strength of that path are included.

In this study, the association between one factor and another is generally positive, except that on average individuals considered that the policies of the present government (Conservative at the time of testing) reduce the prospects of a person's gaining a good education, reduce the power of the trade unions and reduce a person's prospects of employment. In terms of world-wide economic growth, however, the average ratings were positive.

### Cognitive structural models and ratings of effectiveness

As in Expt 1, we calculated for each participant the total path strength of each of the factors and correlated these strengths with their ratings of the effectiveness (and difficulty) of each of the eight factors. Table 4 displays the mean ratings of effectiveness and difficulty averaged over the two conditions of the experiment.

Table 3. Paths and mean path strengths represented by more than 10 per cent of 92 participants in Expt 2

Source factor	Target factor	Number (%) representing the path	Mean path strength (SD)
Increased effort	Employment	83 (90)	61.4 (24.5)
	Willing to move	33 (36)	48.5 (24.0)
	Education	18 (20)	60.6 (24.3)
Willing to move	Employment	84 (91)	36.3 (23.7)
	Increased effort	17 (19)	47.1 (25.4)
Education	Employment	88 (96)	74.1 (16.3)
	High IQ	29 (32)	53.6 (28.9)
	Increased effort	13 (14)	40.0 (29.1)
	Competent management	24 (26)	53.5 (26.2)
High IQ	Employment	62 (67)	44.0 (23.8)
	Education	42 (46)	57.6 (26.6)
	Competent management	10 (11)	52.0 (23.5)
Strong trade unions	Employment	73 (79)	19.4 (36.0)
Economic growth	Employment	75 (82)	60.5 (31.3)
	Government policies	16 (17)	41.9 (38.3)
Competent management	Employment	73 (79)	43.4 (24.1)
	Strong trade unions	10 (11)	34.0 (36.3)
	Economic growth	15 (16)	52.0 (24.8)
Government policy	Employment	61 (66)	−15.2 (54.6)
	Education	24 (26)	−16.7 (70.5)
	Trade unions	38 (41)	−17.6 (54.0)
	Economic growth	43 (47)	14.4 (62.2)
	Increased effort	9 (10)	−19.4 (51.4)

We predicted that completing the diagram before the ratings would lead individuals to represent the indirect paths explicitly rather than implicitly. In consequence, the correlation within participants between the effectiveness ratings and total path strength should be higher than the correlation between the effectiveness ratings and the direct paths strengths alone. The reverse pattern should obtain when the diagram is completed second, that is, when the rating task is completed first.

We examined this prediction by submitting the total path correlation and the direct path correlation, calculated separately for each participant, to a mixed model analysis of variance, with the correlations as the dependent variable. Table 5 presents the relevant data. There was no overall difference between the conditions or between the total path correlation and the direct path correlation ($F < 1$, in both cases). However, the predicted interaction between the type of correlation and experimental
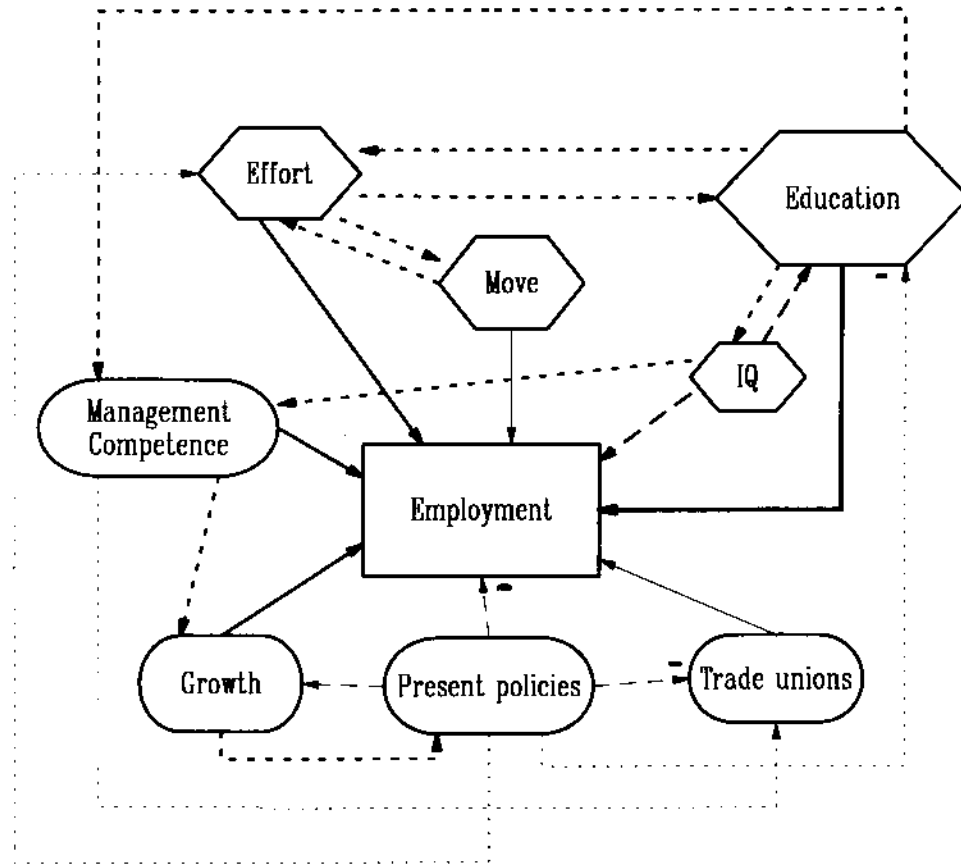
Figure 2. The composite diagram for employment for paths included by 10 per cent or more of the sample in Expt 2. All paths have a positive sign bar three as indicated (see text for explanation). For key see legend to Figure 1.

condition was significant $(F(1,87) = 4.53, p < .05)$. Tests of the simple effects showed that the correlation involving direct path strengths only was significantly higher than that for the total path strengths $(t = 1.75, p < .05,$ one-tailed) when the ratings task was completed first. In contrast, when the diagram was completed first, the correlation for total path strength was marginally greater than the direct path strength correlation $(t = 1.42, p = .081,$ one-tailed test). These differences, though small, are consistent with expectations. The findings suggest that direct paths are relatively more available than indirect paths.

As in Expt 1, further analysis showed that it was the strength of paths rather than the sheer number of paths emanating from factors that correlated with the ratings of effectiveness. The latter correlation averaged $r_m = .098$, which is not significantly different from zero and is significantly lower than the correlations calculated using the direct path strengths or the total path strengths $(p < .001,$ in both cases). Also, in contrast to the significant relationships between effectiveness ratings and path

Table 4. Rated effectiveness and difficulty of different internal and external factors in affecting a person's prospects of employment in Expt 2

Factor	Type	Rated effectiveness (0 = totally ineffective, 10 = completely effective) Mean (SD)	Rated difficulty (0 = not at all difficult, 10 = extremely difficult) Mean (SD)
Increase effort to find work	Internal	7.55 (2.07)	4.57 (2.67)
Encourage people to move to work	Internal	6.37 (2.12)	6.32 (2.38)
Improve their education	Internal	8.85 (1.48)	5.53 (2.33)
Act more intelligently	Internal	6.97 (2.49)	5.71 (2.99)
Increase power of trade unions	External	4.99 (2.32)	6.26 (2.42)
Encourage economic growth	External	7.80 (1.92)	8.57 (2.08)
Improve management skills	External	6.74 (2.31)	5.42 (2.30)
Change government policies	External	6.64 (2.53)	7.81 (2.20)

Table 5. Mean (SD) correlations between path strength and effectiveness ratings (r_m), calculated separately for each participant, as a function of the order of the diagram and rating tasks

Condition	Type of correlation	
	Total path strengths with effectiveness ratings	Direct path strengths with effectiveness ratings
Diagram first	.46 (.25)	.41 (.31)
Diagram second	.38 (.32)	.43 (.30)

* All correlations significant $p < .01$.

strengths (both total path strength and direct path strength only), the mean correlations between difficulty ratings and path strengths were not significantly different from zero ($-.04$). These results confirm and extend those of Expt 1 using a related, but different, domain.

Party political differences in perceived causal structure and in the ratings of effectiveness and difficulty

Unlike Expt 1, but consistent with our predictions that the representation of employment might be less politicized, the difference between the number of paths emanating from internal and external factors was unaffected by political party affiliation ($F < 1$; the average number of paths from internal factors was 5.84 (1.56) compared to 5.36 (1.89) paths from external factors). Nor were there any effects of political party affiliation on individual paths within the models, though affiliation, for some reason, did affect the total number of paths included in the model. Liberal Democrat voters included more paths in their models. The mean number of paths for Conservative Party voters (19) was 10.21 (2.20); for the Liberal Democrat voters (19) it was 12.58 (2.99) and for the Labour Party supporters (36) it was 11.00 (2.43). These differences yielded a significant non-linear trend ($F(1,71) = 8.38$, $p < .005$). However, as we show below, different propensities to include paths do not entail different underlying models.

There were also no significant effects of political party affiliation on the ratings of effectiveness. With one exception, the same was true for the difficulty ratings: Labour Party supporters considered that it would be somewhat easier for an individual to increase their efforts to find work. The mean rated difficulty for this factor as a function of leftedness was 5.63 (2.61), 5.66 (2.50) and 3.43 (2.43) for Conservative, Liberal Democrat and Labour Party supporters, respectively (linear trend, $F(1,69) = 11.52$, $p < .001$). On our critical measures, neither models nor estimates of effectiveness differ as a function of party affiliation.

Is there a common, social representation of employment?

Figure 2 shows, for employment, the composite model obtained by putting together all of the individual diagrams. Is this composite model really consensual? Is there indeed a common, social representation to which all or most participants have access, or is there merely a set of individual diagrams, many of which will be different for various idiosyncratic reasons, but which will inevitably have some commonalities due to sharing knowledge about overlapping content? As we discussed earlier, Muncer & Gillen (1997) proposed a procedural method for constructing network diagrams that are consensual. Here we explore a statistical method for determining whether individual diagrams can be regarded as being different samples from a single common underlying representation.

Statistically, a common, social representation may be conceptualized as consisting of a series of paths between various components, some of which are more salient than others, and hence more likely to be included in any individual model. Individuals would differ in their propensity to include paths in their diagrams (perhaps as a function of personality, social demand or experimental conditions or tasks), and each group of individuals would sample randomly from the paths in the social representation, but with a higher probability of sampling from those paths which are more salient. The first implication is that a factor analysis of the correlations between the presence of paths should show a single underlying factor. If instead the factor

structure suggests two or more factors, then individuals could be seen as sampling from different representations, and there would not be a single social representation of the domain; or to put it in a slightly different way, knowledge of the inclusion of a particular path in an individual's model would not allow an adequate prediction of the presence or absence of any other path.

We used the program MicroFACT 1.0 (Waller, 1995) to carry out a principal factor analysis of the path correlation matrix (see footnote 1 for technical details).[1] Table 6 shows the 23 paths used in the factor analysis and their factor loadings and communalities. The factor analysis showed clear evidence of a single factor using the conventional scree-slope criterion, the first 10 eigen-values being 9.73, 3.16, 2.48, 1.57, 1.38, 1.15, 0.95, 0.84, 0.53 and 0.49. All factor loadings except one are larger than .35, and 15/23 are greater than .5. The overall fit of the model can be seen from the mean squared residual being 0.03, the mean residual being 0.003 (0.17) and the interquartile range of the residuals being −0.114 to 0.101. The data for the paths in the employment models therefore seem to be unifactorial.

If the paths are unifactorial, then item response theory (IRT; Hambleton, Swaminathan & Rogers, 1991; Weiss & Yoes, 1991) should provide an adequate fit to the data: or to put it another way, if the data are not unifactorial then an IRT model should show significant residuals, and hence a poor fit; and, in addition, the discrimination parameters will be low either for all of the paths, or, if diagrams differ on only some paths, then for those paths where differences between participants occur. IRT was originally described for modelling the performance of examination candidates in situations in which it can be assumed that there is a single underlying dimension of ability. It has since been shown to be suitable for analysing a much wider range of psychological data (Thissen & Steinberg, 1988). In the present situation the items on the test can be considered the *paths* in the models. Applying IRT allows us to obtain two separate parameters for each path (its 'difficulty' and its 'discrimination') and a single parameter for each individual (analogous to his or her ability), his or her propensity to include paths.[2]

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[1] Factor analysis of the presence or absence of paths in the models is not straightforward since they are binary items (present/absent), and it has long been known in factor analysis that factor analysis of binary items using conventional Pearsonian correlations typically results in spurious multiple factors related to the difficulty of the items (Carroll, 1945; Gorsuch, 1983; Maxwell, 1977). This problem can be circumvented by using tetrachoric correlations, where the calculated correlation is independent of the marginal proportions present on each of the items. MicroFACT 1.0 calculates a smoothed tetrachoric correlation matrix between items, and then carries out a principal factor analysis of the resulting correlation matrix. Paths can only be included in such an analysis if a reasonable proportion of participants has included them (and paths which have never been included by any participant are necessarily uninformative). In Expt 2, 92 participants provided information for the analysis, and for 23 paths at least 10 per cent of the participants had included that path in a model.

[2] Examinees are assumed to differ in a single parameter, θ, their true ability on the test. The kth item on the test can be modelled in terms of two parameters in IRT. The first parameter is its difficulty, b_k, the ability level of candidates necessary for half the candidates to get the answer correct. The second parameter is its discrimination, a_k, in effect, the slope of the relationship between true ability and the proportion of candidates getting the item correct. Good items which discriminate well will have steep slopes, whereas items with no discriminatory ability at all, being as likely to be answered correctly by high as by low ability candidates, will have a slope of zero. The true ability of each candidate is the parameter, θ_i, so that for the kth item the probability of a correct answer is given by the following equation where D is an arbitrary and conventional constant of 1.7.

$$P(item\ correct) = \frac{e^{D.a_k.(\theta_i - b_k)}}{1 + e^{D.a_k.(\theta_i - b_k)}}$$

Table 6. The factor loadings and communalities for each of the 23 commonest paths in the employment model, Expt 2 ($N = 92$), and the b (difficulty) and a (discrimination) parameters for the paths in the item response theory model. The 'codes' refer to the labels on Fig. 3

Path	Code (Fig. 3)	Factor loading	Difficulty b (SE)	Discrimination a (SE)
Education to employment	1	.875	−2.88 (.44)	.59 (.17)
Willing to move to employment	2	.869	−2.45 (.37)	.59 (.17)
Effort to employment	3	.809	−2.38 (.36)	.58 (.17)
Economic growth to employment	4	.896	−1.80 (.32)	.52 (.18)
Managerial competence to employment	5	.925	−1.64 (.31)	.52 (.19)
Trade unions to employment	6	.856	−1.55 (.28)	.59 (.19)
IQ to employment	7	.855	−0.90 (.26)	.54 (.25)
Government policies to employment	8	.677	−0.84 (.25)	.56 (.25)
Government policies to economic growth	9	.431	0.25 (.28)	.45 (.38)
IQ to education	10	.611	0.36 (.31)	.42 (.39)
Government policies to trade unions	11	.633	0.59 (.28)	.46 (.33)
Effort to willing to move	12	.614	0.92 (.29)	.47 (.28)
Education to IQ	13	.513	1.17 (.28)	.49 (.24)
Government policy to education	14	.562	1.46 (.29)	.52 (.21)
Education to managerial competence	15	.357	1.52 (.30)	.49 (.21)
Effort to education	16	.396	2.10 (.35)	.46 (.19)
Willing to move to effort	17	.394	2.13 (.35)	.48 (.18)
Economic growth to government policy	18	.470	2.10 (.33)	.51 (.18)
Managerial competence to economic growth	19	.353	2.18 (.33)	.53 (.18)
Education to effort	20	.423	2.28 (.34)	.54 (.17)
Managerial competence to trade unions	21	.607	2.46 (.35)	.58 (.17)
IQ to managerial competence	22	.528	2.45 (.35)	.59 (.17)
Government policy to effort	23	.092	2.63 (.38)	.56 (.17)

This model was fitted by the program XCALIBRE for Windows, version 1.0 (Anonymous, 1995). It fitted well with only one of the 23 paths having a residual greater than 2.0, which, since it corresponds to about a 5 per cent level of significance (Anonymous, 1995), would be expected on about 5 per cent of the occasions. The IRT analysis therefore supports the hypothesis that the data are unifactorial. Table 6 shows the estimated difficulty and discrimination parameters for each path, and it can be seen that the difficulty parameters span the entire range of propensities to include a path. In addition, the similarity of the discrimination parameters supports the unifactorial nature of the data. Figure 3 shows at the bottom the estimated θ parameters (the propensity to include paths) for each of the 92 participants, and at the top, on the same scale, the item characteristic curves for each of the 23 paths. By

In the present situation the items on the test can be considered the *paths* in the models and the ability of candidates as their *propensity to include a path* in their model. The two-parameter item response theory model, fitted by the program XCALIBRE for Windows, version 1.0, assumes that the θ parameters for participants have a mean of 0 and a standard deviation of 1. As noted in the text, the two-parameter model fitted well, with only *one* of the 23 paths having a residual greater than 2.0.

scanning upwards from a participant's θ value at the bottom, to the item characteristic curves at the top, one can see the probability that a particular participant will include each of the 23 paths in their model. The a (discrimination) parameters are very similar indeed across the paths, suggesting that in fact a one-parameter item response model would be adequate (although this model cannot be fitted as such by XCALIBRE). The b (difficulty) parameters show a wide range with a greater concentration of values above zero (i.e. less than half of the participants are including the path) than below zero.
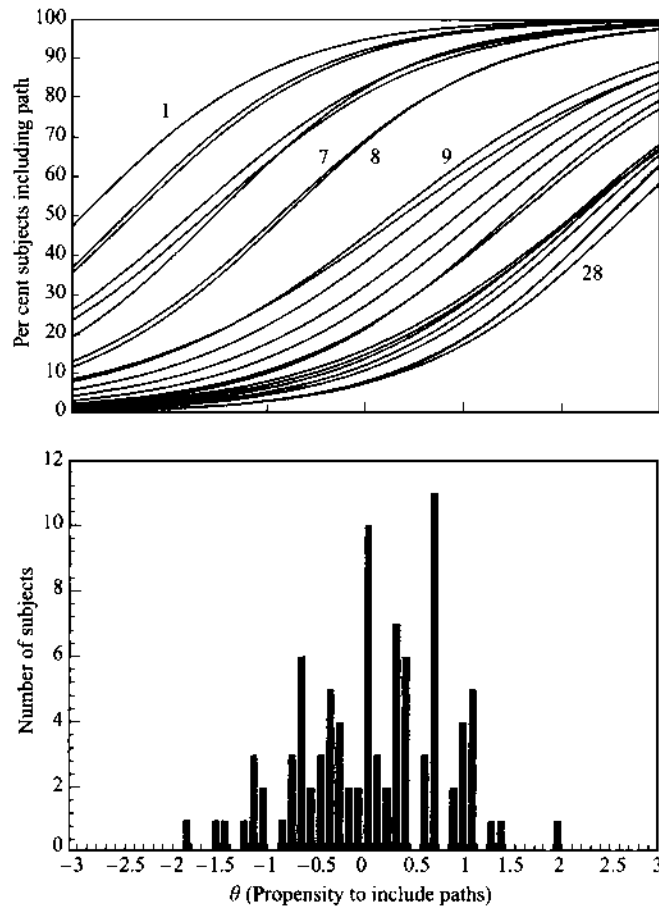
Figure 3. The top figure shows the item characteristic curves for each of the 23 paths in the employment diagram, Expt 2 (labelled for a few examples as in Table 6; not all curves have been labelled for clarity), and the bottom figure shows the estimated θ (theta) scores for each of the 92 participants, with the upper and lower figures being on the same scale.

The factor analysis and IRT analysis of the employment data suggest that there is a unifactorial model underlying the different individual diagrams produced by participants. The composite model in Fig. 2 does seem to reflect a single social

representation with participants differing from the consensual representation in the extent to which they are willing to include paths, with random, probabilistic sampling accounting for the other differences between the individual diagrams.

GENERAL DISCUSSION

The present studies confirm and extend work by Green & McManus (1995) by showing in a social domain that a person's network diagram or cognitive structural model of a set of factors that might affect a target phenomenon correlates with their ratings of the effectiveness of actions based on these factors. In both studies it is not simply the number of paths emanating from a factor that is critical but the strength of these paths. In Expt 1, individuals drew a diagram before rating the effectiveness of different actions designed to reduce a person's prospects of unemployment. In this case, total path strength correlated more highly with rated effectiveness than the direct path strength alone. Experiment 2 (where the target phenomenon was employment) varied the order of completing the two tasks. In line with our expectations, total path strength correlated more highly than direct paths strength with the ratings of the effectiveness of actions when the diagram was completed first (as in Expt 1) but the reverse result obtained when the rating task was completed first. The act of drawing the diagram appears to lead individuals to represent indirect paths explicitly rather than tacitly. In a sense such a result confirms that thinking about an issue, or learning more about it (see Green, 1996) alters its mental representation. Such elaboration occurs in the present context in the course of constructing a diagram, but talk or debate about an issue might be expected to lead to such elaboration, too.

A second motivation for these two studies was to examine the extent to which a person's representation of an issue is politicized. In both studies individuals were asked to draw a diagram indicating the relationship of various internal and external factors to a person's prospects of unemployment (Expt 1) or employment (Expt 2). Taken together, the two studies reported here indicate that the framing of a problem may affect its representation. Party political affiliation affected the representation of unemployment but did not differentially affect the representation of employment. In the case of unemployment, and consistent with earlier findings (Furnham, 1982; Lunt, 1991), individuals voting Labour represented more paths from external factors (e.g. government policies) compared to internal factors (e.g. education). For employment there were no such differences. We acknowledge though that the effects of party political affiliation on the representation of unemployment were relatively selective. In consequence, our data do not warrant the strong claim that unemployment is a politicized representation whereas employment is not. It may also be that other factors (not included here) would show a difference as a function of political party affiliation.

In Figures 1 and 2, we presented composite cognitive structural models of unemployment and employment. These were composed using paths endorsed by 10 per cent or more of the sample. In addition, unlike previous work using the matrix method, these figures show the position of the target phenomenon within the network of relations and the mean strengths of the various paths. How should these

representations be viewed? There are two issues here. First, does the method of elicitation dictate the outcome? Individuals were group tested and it might be felt that they sought to give some kind of correct answer. But our participants had not used diagrams for the purpose of representing their thoughts on these issues before and so it is hard to see what kind of ideal they could have aimed at. Also, unlike the matrix method, we did not require individuals to consider each possible relation. In addition, our instructions made it absolutely clear that we were interested in knowing their perceptions. The results of our analyses on unemployment are also consistent with other data using other techniques so this diagram method is not obviously artifactual. It might be objected that all such elicitation methods are flawed—there are no mental representations of such phenomena, merely representations that are constructed during the flow of talk. We have already considered such a view in the beginning of this paper: we reiterate that in order to succeed in communicating individuals must share or construct common ground. What is constructed in discourse is constrained in part by what is already shared or is assumed to be shared and this must be mentally represented.

The second issue concerns the status of the composite models: is it a depiction of a social representation of a group or community of individuals? If a social representation is viewed as a representation of consensual or shared beliefs (e.g. Jaspers & Fraser, 1984), then one can ask about the extent to which such a representation is shared and hence really is a 'social' representation. In the case of the employment data of Expt 2, with its relatively large sample we were able to show using factor analysis and item response theory that individual diagrams are consistent with individuals sampling from a single consensual representation—individuals differ in their propensity to include paths. For our sample there does seem to be a social representation of employment.

If this is the case, then a technique such as the matrix method, which encourages individuals to include more paths (because it requires them to consider the possibility of a path between factors taken two at a time), should reveal the same representation as long as the matrix also included the target factor as well. The statistical techniques described here provide a way to determine whether or not different elicitation techniques tap into a common representation or not. The procedural method advocated by Muncer & Gillen (1997) provides an alternative approach to this problem by directly establishing what is common. It necessarily ignores of course the issue of individual differences in the potential to include paths that we have sought to address statistically.

Now although we have considered the consensual nature of the representation, we happily endorse the notion that the social representation of some phenomenon is social because it arises in a social context and underlies social exchange (Moscovici, 1988). Earlier, in commenting on the word association responses of rural children from a remote village, Luria (1974/1930, p. 22) wrote of the environment speaking through the individual. We consider individuals as detectors (and also transformers, of course) of this social representation (as expressed in various media and in the social practices of the community). The network diagrams of each individual within a social group may differ only because they have different thresholds for including paths. It is important to stress that although individuals are asked to draw diagrams it does

not follow that the information they use is necessarily conscious or verbal. The paths they represent might reflect explicit knowledge, or arguments, but may also represent a 'felt possibility' or tacit knowledge. Likewise, the ratings of the strength of the causal connection might impound (in the economic sense) or capture both cognitive and emotional information.

In the terms of social judgment theory (see Doherty & Kurz, 1996) individuals might be seen to relate various environmental and cultural cues (e.g. media representations) to judgments of causal efficacy. Individuals can be viewed as 'containers of chunks of social thinking' (Joffe, 1996; see also Luria, 1974/1930) that link thought and action. Accordingly, the cognitive structural models we have described and the ratings of the effectiveness of different actions both index this social representation. Hence, our measures may correlate, not because a cognitive model of a situation invariably precedes action (though it may do so) but because the model and the ratings derive from a common source (cf. Wagner, 1994). We have some sympathy for this view. It is consistent with the findings of Jodelet (1991) who argued that though French villagers had willingly taken in mentally ill lodgers their actions of washing their lodgers' clothes and eating utensils separately, indicated a view of madness as contagious. But beliefs about the effectiveness of actions are different from beliefs about the difficulty of carrying them out. Cognitive structural models predicted the former not the latter. When individuals reflect on what they may do, both are important. We hope the methods we have described here may contribute to the exploration of social representations in other spheres and to informing practical work on, for example, health communications (Eadie & Davies, 1992).

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