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## Income effects of unemployment and short-time work in the East German transformation process

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# **Deutsches Institut für Wirtschaftsforschung**

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## **Income Effects of Unemployment and Short-Time Work in the East German Transformation Process**

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## Abstract

Income effects of unemployment and involuntary short-time work are investigated in the context of the East German transformation process from a planned socialistic economy to a market-oriented economy. Theoretical considerations from human capital theory are derived for the income effects in case of later employment. Special attention is given to the benefits of officially supported training courses and impacts of a change to a new firm. The estimation of income effects uses a variance components model which reflects not only a time-constant unobserved heterogeneity but also person-related components which are linked to the two economic regimes. The empirical basis is the German Socio-economic Panel (GSOEP) which provides income and employment data for both periods.

## 1 Introduction

It is unusual for an interruption to an individual's working biography, whether voluntary or enforced, to have no further implications for that individual's future employment. For western market economies the knock-on risks of unemployment for employees' further career have already been analysed in a number of studies (for example cf. Addison and Portugal 1989, Topel 1990 or Licht and Steiner 1992). Research into the eastern transitory labour markets, on the other hand, with its whole spectrum of regionally specific factors, has only just begun.

More than two years after Unification, the east German economy is still undergoing major structural change. Following the massive economic contraction, the scale of which took almost all observers by surprise, some branches are now beginning to show the first signs of success under the new economic order. Even so, there will be no significant improvement in the situation for the east German economy as a whole during 1993 (cf. DIW 1993). Such adverse economic trends are reflected particularly clearly on the labour market, with high rates of unemployment and involuntary short-time working. The economically active population of eastern Germany fell within three years from 10 million (end 1989) to a little over 6 million (1992). Registered unemployment averaged 1.2 million in 1992, a figure which is unlikely to fall significantly in 1993, according to forecasts made by the DIW. Short-time working, on the other hand, an instrument very widely used in the first two years, has now declined in importance. The number working short-time peaked in the second quarter of 1992 at almost 2 million; by the autumn, though, just 250 000 workers were registered as being on short-time (cf. DIW 1993).

In this article we analyse the impact of unemployment and short-time working on subsequent earned incomes for east German

male workers. Subsequent income trends constitute - alongside the risk of renewed unemployment and the lower quality of subsequent employment - a central indicator for any evaluation of the effects of a career break. The study seeks to establish whether periods of unemployment and short-time working differ in their income effects<sup>1</sup>. This question is particularly relevant to the current debate on German labour market policy, as the instrument of publicly supported short-time working has been widely deployed in the new federal states (Länder) of eastern Germany with the aim of protecting workers from "direct" unemployment and its supposed consequences.

Another policy instrument also used in the new Länder on a massive scale is the retraining and further training offered those affected by unemployment and short-time working. This begs the question, to what extent these instruments have proved able to mitigate the negative income effects of enforced temporary withdrawal from the labour market. This question forms the second focal point of our study, which should go some way to evaluating the effectiveness of this policy instrument.

The analysis must clearly take account of the fact that the east German labour market is currently undergoing a major transition from a centrally planned to a market-oriented system. More specifically, it must be recognized that income structures have changed fundamentally, even without the effects of breaks in working life. Great care must therefore be taken, when analysing income trends, to distinguish between the two income-relevant effects; withdrawal from employment on the one hand, and the dramatic changes in economic structures on the other.

## 2. Theoretical considerations

The majority of economics-oriented, empirical studies of the impact of unemployment on earnings are based either on

neoclassical-utilitarian approaches (such as human capital theory and search theory), or on alternative approaches such as the theory of labour market segmentation.

The approach taken by this study is based on human capital theory<sup>2</sup>. Search theory (for an overview cf., for example, Mortenson 1986) is, in our view, inappropriate to our context, as the theory assumes periods of unemployment to be primarily voluntary in nature: this is clearly at odds with the current situation on the east German labour market. The same is true of the theory of labour market segmentation (cf. for Western Germany, Sengenberger 1987), which explains the slow wage growth of the unemployed on re-entering paid employment, by their role in the secondary segment of the labour market. The labour market dichotomy postulated by this theory - a primary segment characterised by high income, stable employment relations and guaranteed chances of promotion, on the one hand, and a secondary segment in which low wages are linked to high employment risks - is not (yet) a valid description of the east German labour market: at the very least, the borderline between the two segments is still very permeable.

Our approach, based on human capital theory, explains the income losses resulting from unemployment in terms of damage to, and devaluation of, occupation and firm-specific human capital. This line of research has developed along the path set out by the pioneering, "classic" studies of Mincer and Polachek (1974) and Polachek (1975). The same basic explanatory model, derived from human capital theory, can also be applied to involuntary interruptions to work careers such as result from unemployment and short-time working.

The income effects of involuntary interruptions to work careers can be separated into a direct income effect during the non-employment phase, and the knock-on effects for subsequent income development after re-employment. The direct income effect



results from the total (unemployment) or partial (short-time working) loss of earned income. This income loss is mitigated by wage-compensation benefits, the level of which depends on the mode of entry into non-employment, prior duration of employment (in the case of unemployment), the extent to which working hours are reduced (in the case of short-time working), and socio-demographic characteristics (family status, number of children etc).

Analytical interest focuses, however, on the knock-on effects of involuntary interruptions to work careers. Three partial effects can be derived from human capital theory.

**The direct knock-on effect:** During the non-employment phase the stock of acquired human capital is subject to rapid depreciation. Here it seems important to distinguish between the different components of human capital. The evaluation of firm-specific knowledge varies according to whether re-employment occurs in the same firm (temporary lay-off, short-time work), or whether it is linked to a change of employer. In the latter case, the previously acquired, firm-specific human capital is non-transferable, and so worthless in the new firm.

**The restoration effect:** Provided human capital is not completely devalued by the interruption, the restoration effect works counter to the direct knock-on effect. The restoration effect manifests itself in a relatively rapid growth of income following re-employment, so that the income profiles of employees with interrupted work careers gradually approach those in continuous employment. In "stable" western industrialised countries, the restoration of devalued human capital is accorded great importance, as the costs involved are generally lower than those for the first-time acquisition of human capital.

**The indirect knock-on effect:** During the non-employment phase no (further) occupational and firm-specific human capital can be formed. Consequently, employees with discontinuous work

biographies tend to "lag behind" those in continuous employment in the accumulation of human capital.

These, the "classic" effects of involuntary interruptions to working careers have recently been empirically investigated and confirmed for western Germany (Licht and Steiner 1992). The initial re-employment wage of men who had been unemployed for 12 months was an average of 5% below their last wage (direct knock-on effect). In subsequent years, though, a marked restoration effect compensated for this "loss". Allowing, finally, for the indirect knock-on effect, though, after three years these male workers were still earning about 4% less than those remaining in continuous employment.

The theoretical approach discussed above is, however, unlikely to be sufficient for the task of evaluating career interruptions on the east German labour market. As in the discussion concerning the evaluation of the real capital stock in the new federal states, it seems sensible to make an analogous distinction for human capital between "old" human capital, i.e. that acquired in the GDR, which is less productive under market conditions, and a "new" stock of human capital, which is more productive in the context of the use of new technologies.

In other words, the classic effects of career discontinuity must be supplemented by a transformation effect. Moreover, in the conditions prevailing on the east German labour market the direct knock-on effect and the restoration effect must be evaluated rather differently. The impact on individual income profiles of these two effects is heavily dependent on overall income developments. The slower the overall growth of incomes, the less significant the relative income losses resulting from career interruptions. In the GDR the age-income profile was very much flatter than in western industrialised countries (cf. Schwarze 1993). More importantly, major components of the human capital acquired in the GDR have been all but completely devalued by the

change to modern western technology. Compared with this, the loss of human capital due to career discontinuity may be relatively small. Even though this process of devaluation has been very largely cushioned by social legislation, and slowed by collectively bargained forms of regulation, it still serves to mitigate the relative importance of human capital loss due to career interruption: it merely proceeds *more rapidly* for those workers with career discontinuity than is the case with the rest of the working population. Similarly, the restoration effect would appear to be irrelevant to the present east German context.

The role played by the indirect knock-on effect is different again. Compared with those who have remained in employment in "old" GDR-firms, the losses due to the non-accumulation of additional human capital for the unemployed and those on short time are likely to be relatively insignificant. Both groups are, though, separated by an ever-widening gulf from those employees working in newly founded or successfully privatised firms, operating western technology, and whose income profiles rise sharply, particularly in the initial period. In the current, innovative phase, such workers are able to accumulate the fundamental know-how required for a productive activity in a competitive market economy.

This trend can be countered to some extent by a retraining and further training effect: In the current east German context, a sharp rise in income profiles can be expected for those workers whose human capital "made in the GDR" is supplemented by "modern" human capital, such as computer and data processing know-how. This newly acquired human capital should, on re-employment, enable workers to achieve rapid income growth.

An additional significant factor, one which is, in this form, specific to the transformation process under way on the east German labour market, is the **firm-change effect**. Firm or employer change in this context can usually be taken to mean the

change from an existing GDR firm to a successfully privatised or newly founded firm, as the majority of firms recruiting additional labour are those now operating successfully under competitive conditions. Newly founded firms, in particular, operate at a far higher level of productivity than former GDR firms. Indeed, as they have been set up with the most modern technological plant and equipment, their productivity is often higher than in comparable west German enterprises (examples include the Opel car factory and the Volkswagen plant at Eisenach). Consequently, a change of employer can be expected to lead to perceptible income effects.

The diverse effects exerted on subsequent income trends by a break in working life through unemployment or short-time working can be derived directly from the above theoretical considerations. Due to the continued, if reduced, opportunities for training it can be assumed that workers on short time will suffer less from an erosion of their human capital than the unemployed. This is only the case, however, to the extent that they are able to acquire knowledge which is appropriate to work in a market-oriented firm. In addition, those on short time may be able, if sales improve, to regain employment in their old firm, thus avoiding the complete loss of the firm-specific components of their human capital. This again differs from the situation faced by the unemployed, who must generally accept the irretrievable loss of such components<sup>3</sup>. Yet, for the reasons given above, this effect is likely to be of only secondary importance. If we control for change of firm, training measures and the length of career interruption, we would not expect major differences between the unemployed and short-time workers in east Germany regarding their knock-on income effects.

The most important conclusions drawn from our theoretical considerations can be summarised as follows.

- A number of factors suggests that the effects of involuntary career discontinuity in east Germany differ considerably from those typical in the West. In fact, the classic effects, derived from human capital theory, can be expected to be largely irrelevant to the east German situation.
- The direct knock-on effect will play a relatively minor role as the human capital amassed by all employees in the former GDR has been subject to a process of devaluation.
- The indirect knock-on effect is expected to play a role, particularly compared with employees in privatised and newly founded firms. Such workers are able to accumulate market-oriented, "new", firm-specific human capital, reflected in a sharp rise in their income profile; the unemployed are excluded from this process for the duration of their non-employment. Short-time workers are only able to participate in this process to the extent that they are actually integrated into the on-going work of their enterprise, placing them at an advantage over the unemployed as far as income is concerned.
- This effect can, however, be mitigated, or even overcompensated, by further training and retraining during the interruption and subsequent employment in a market-oriented firm.

### **3. The empirical approach**

#### **3.1 Data base and methodological concept**

The empirical study is based on the first three waves (1990 to 1992) of a sample of east German households in the German Socio-Economic Panel (GSOEP, cf. Wagner et al. 1993), drawn up immediately before monetary, economic and social union on the territory of the then German Democratic Republic. In the first

wave 2 179 households with a total of 4 453 persons (aged 16 and above) were surveyed.

The GSOEP is particularly well-suited to analysis of the present topic. The observation period covers that phase of the transformation process in which the problem of short-time working was most acute. In addition, the retrospective information obtained from the first wave enables us to pursue income trends (the term "income" refers in the following to the wage and salary income of those surveyed) back to May 1989, i.e. to a point in time at which incomes were unaffected by either the massive structural changes brought on by economic union, unemployment or short-time working. Last but not least, the "activity calendar" covering the entire year month by month enables the researcher to determine the precise relationship over time between reported income levels and periods of unemployment and short-time working.

For these persons a maximum of seven figures were obtained for gross monthly earnings. These are the incomes reported at the time of the three surveys (spring 1990, 1991 and 1992) -  $Y_{S90}$ ,  $Y_{S91}$ ,  $Y_{S92}$ . In addition we obtained retrospective figures on income at the following points in time: May 1989, May 1990, October 1990 and October 1991 ( $Y_{R5/89}$ ,  $Y_{R5/90}$ ,  $Y_{R10/90}$ ,  $Y_{R10/91}$ ).

It would be conceivable to link these data with information from the "activity calendar" in order to draw up the necessary categories (before/after unemployment/short-time working) for each individual. However, this would prevent us from drawing a sufficiently clear distinction between the effects on the individual of varying periods of unemployment or short-time working and the effects exerted on all those surveyed of the structural upheaval which followed economic union. The use of a fixed reference period for unemployment and short-time working offers a way round this problem.

The reference period for any phase of unemployment or short-time working experienced by respondents was set at between July

1990 and September 1991. All those who were unemployed or on short time for at least one month during this period fall under the observation group ("unemployed/short-time workers"). The income results  $Y_{r5/90}$ <sup>4</sup>,  $Y_{r10/90}$  and  $Y_{s91}$  are therefore excluded from the analysis. For the remaining four income reports the time-relation to the phase of unemployment or short-time working is then clearly defined. The four income results are first divided into two categories: "Before" ( $Y_{b1}$ ,  $Y_{b2}$ ) and "after" the reference period ( $Y_{a1}$ ,  $Y_{a2}$ ); these designations are retained in the following.

### 3.2 Econometric model

It can be safely assumed that the significance of the selected covariates for earnings does not remain constant during the transformation process. Consequently, the parameter vector of the exogenous variables is estimated differently with reference to the "before" and "after" periods. Similar considerations apply to the variance structure, which needs to be specified. The constant, personal component of the error term (unobserved heterogeneity) is usually assumed to remain constant over the entire observation period. In view of the scale of the transformation process, however, it would appear plausible to assume that the unobserved heterogeneity is not the same in the two periods (cf. on this Schwarze 1993). For this reason, the error term is split into three components:

- $\mu_i$ : the personal component which is constant over time;
- $\alpha_i^b, \alpha_i^a$ : the personal components which are ascribed to one of the two periods (before/after);
- $u_{it}$ : independent shocks at different points in time.

The econometric model then has the following form:

$$\begin{pmatrix} Y_i^b \\ Y_i^a \end{pmatrix} = \begin{pmatrix} X_i^b \beta_b \\ X_i^a \beta_a \end{pmatrix} + \begin{pmatrix} \epsilon_i^b \\ \epsilon_i^a \end{pmatrix}$$

$$\Sigma = \text{Cov} \begin{pmatrix} \epsilon_i^b \\ \epsilon_i^a \end{pmatrix} = \sigma_\mu^2 I + \begin{pmatrix} \sigma_{\alpha^b 1_b}^2 & 0 \\ 0 & \sigma_{\alpha^a 1_a}^2 \end{pmatrix} + \sigma_u^2 I$$

where  $Y_i^b = (Y_{i1}, Y_{i2})$  is the income vector before the change, and  $Y_i^a = (Y_{i3}, Y_{i4})$  the income vector after the change.  $X_i^b$ ,  $X_i^a$  and  $\epsilon_i^b$ ,  $\epsilon_i^a$  are similarly defined.

In order to ensure an efficient estimation, the aim must be to use as much of the available income data as possible (unbalanced design). With the likelihood approach the use of the not complete cases is a relatively simple task. Let  $Y_i$  be the vector of the observed  $Y$  values for the person  $i$ .  $Y_i$  results from deleting the appropriate rows of  $(Y_i^b, Y_i^a)$ .  $X_i$  and  $e_i$  are similarly defined. The covariance matrix  $\Sigma_i = \text{Cov}(e_i)$  belonging to person  $i$  is derived from  $\Sigma$  by deleting those rows and columns for which no observation is available. Given a normal distribution for  $e_i$ , the likelihood contribution of person  $i$  is as follows:

$$L_i = (2\pi)^{-k_i/2} \det(\Sigma_i)^{-1/2} \exp(-1/2 e_i \Sigma_i^{-1} e_i')$$

where  $k_i$  is the number of observations for person  $i$ . The parameters  $\beta_b$ ,  $\beta_a$ ,  $\sigma_\mu^2$ ,  $\sigma_{\alpha^b}^2$ ,  $\sigma_{\alpha^a}^2$  and  $\sigma_u^2$ , are derived by maximising  $\sum_i \ln(L_i)$ .

The model is estimated separately for those affected by career interruptions and those in continuous employment (reference group). In this context, a remark on sample-selectivity is necessary. The effect of sample selection on the estimation of the model depends on the population for which the results are to be interpreted. In this case the population consists of those individuals who have regained employment after an interruption to their working life. The parameter estimates



derived from the model presented above are consistent estimates for this group of persons. Correcting for this selectivity implies the aim of deriving results for a wider population, in this case, for instance, by adding those whose career interruption is not yet over. However, this begs the question which kind of income is implied, and how it is to be interpreted since jobless men have no real income. Moreover, estimates with correction for selectivity are extremely sensitive to the specification of the underlying participation equation (cf. Rendtel 1992), a matter of great significance in the present context. Last but not least, too little research has been done on the re-employment of the unemployed in the massive transformation which the east German labour market has experienced.

### 3.3 Operationalising the model variables

The endogenous model variable is the monthly gross income from full-time employment, expressed by its logarithm. The methodological concept adopted means that a maximum of four income values are incorporated for each individual - two before and two after the reference period. Having excluded any implausible values, the following number of cases of valid income data were available for the four surveys ( $Y_{b1}$ ,  $Y_{b2}$ ,  $Y_{a1}$  and  $Y_{a2}$ ) respectively: 368, 395, 347 and 350.

The exogenous variables can be divided into three groups. The first affects both  $y_b$  and  $y_a$ . This group covers education and vocational training, job experience and length of job tenure. The second consists of the variables: "change of employer", affecting only  $y_a$ . The third group consists of variables which measure the effects of involuntary interruptions (unemployment and short-time working) and examine the impact of participation in retraining and further training schemes on income levels. These variables,

which only apply to  $y_a$ , play no part in the estimation model for the control group.

Education and vocational training is operationalised using the information from the biographical questionnaire (means and standard deviations of all the variables used are shown in table 1). This means that, unlike in the majority of other analyses it is not the legally stipulated, but rather actual time spent in education and training which enters into the calculations. The training periods calculated for both forms of training (in years) are brought together in one variable. This variable enters the model along with a constant value per person.

Job experience is also measured by means of biographical information, i.e. its "real" value is ascertained. Length of tenure with the present employer was established for all four panel waves by means of a complex system of questions relating to the time of survey.

Any change of firm reported refers to a change since July 1990, the begin of the reference period. Once a change has occurred the change-dummy remains at "1" for subsequent waves.

For those respondents experiencing unemployment or short-time working during the reference period, the following characteristics were determined: First, the duration of the career interruption in months is ascertained from the activity calendar. Second, the most recent search status - unemployment or short-time working - is determined, in order to fix the nature of the search position immediately prior to re-employment (where this occurs).

Further, it is determined whether or not in the observation period, the person took part in retraining or further training schemes during their enforced non-employment. Empirically the distribution of the data (in months) shows two peaks: most frequently observed were training activities lasting less than six months and those requiring half a year and longer.

Qualitative differences in training activities can be expected to correlate with the duration of the schemes. As the inclusion according to a metric scale of training duration would not account for this, training measures were incorporated into the model by means of two dummy variables - participation in training lasting six months or less, and in that of longer than six-months' duration.

#### 4. Results

The results of the maximum likelihood estimates for the incomes of male workers in continuous and discontinuous employment are presented in tables 2 and 3. Each table contains the estimation results for two models which differ in their covariance structure. In the first model the unobserved heterogeneity of the population affects all four times of income reporting equally; this corresponds to the classic error component approach (column 1). The second model (column 2) was estimated using the covariance structure specified in sub-section 3.2 above<sup>5</sup>. The following discussion of the results of the estimation concentrates on the group experiencing career interruption due to unemployment or short-time working. However, in order to be able to locate these results within the framework of the transformation process in the east German economy, we turn first to a description of the most important results for the male workers in continuous employment (table 2).

The income-yield for each year of education and vocational training has (as yet) scarcely changed, amounting to 3.7% (before) and 4.1% (after)<sup>6</sup>. General work experience also exhibits the significant income effect postulated by human capital theory, both before and after the observation period<sup>7</sup>. Length of job tenure, on the other hand, is not significant for the income level<sup>8</sup>.

A striking finding is that changing to a new firm induces a significant, positive income effect in the first model, whereas in the second this effect disappears altogether. The discrepancy between the results of the two models indicates problems with the data: during the period under consideration a large number of firms changed name and legal form; former large industrial combines were split up into smaller, independent companies. It is possible that many respondents interpreted such changes as a change of firm, and indicated as such in the questionnaires, although they had not actually changed their job. This variable should therefore be considered primarily as an indicator for the second period for those in constant employment. In the first model, which controls only for unobserved effects which are either stable over time or occur merely as one-off shocks, such a variable cannot be interpreted as "noise". This is, however, possible in the second model. It is apparent that, in this specific context, the response "I have changed job" has little practical significance for those in continuous employment. This is not the case for those experiencing career discontinuity, for whom in the vast majority of cases a positive response to the question of firm change in the survey indicates a "real" change of job (table 3).

Turning to the relative magnitude of the variance components, we see that the unexplained, time-constant component constitutes a relatively minor proportion of the overall variance not explained by the covariates (45% in the period before; just 29% in the period after). In other words, as far as the not directly observed characteristics are concerned, the importance of the constant characteristics declines, while that of period-specific characteristics increases (from 40% "before" to 62% in the period after).

Analysing the results of the estimation for male workers whose careers have been interrupted by unemployment and short-

time working (table 3), the first interesting point is the somewhat higher - compared with the control group - yield on general education. One should beware of jumping to the conclusion that this reflects a systematic selection effect, however. Comparing the yield on education using a t-test generates an empirical value of 1.09; the difference is thus not statistically significant.

Following career discontinuity, work experience loses its significant influence on income level. The question remains whether this effect is to be ascribed to a general devaluation of firm-specific human capital or should be interpreted in the context of the change of firm usually associated with career interruption. The majority of recruiting firms can be assumed to be newly founded companies or successfully privatised firms for which the firm-specific human capital accumulated under the planned economy is practically worthless. Consequently, the restoration effect with regard to these components of human capital observed in western industrialised countries is insignificant. Those re-entering employment with a job in a new firm are rewarded with a substantial rise in income of almost 19%.

Each additional month of unemployment or short-time working is reflected in a 2% drop in initial earnings on re-entry. Whether or not this is the direct result of the interruption, in terms of a further depreciation of human capital, remains unclear, however. This would in any case contradict the hypothesis discussed above. On re-employment the income earned by those previously unemployed is lower than that of those previously on short-time working. Quantitatively, though, this effect, at 2%, is relatively small. It may well be that this effect is due primarily to the fact that those on short time are able to participate in in-plant training activities.

Retraining and further vocational training (operationalised with a duration of six months and longer) have a positive income effect. Unemployed and short-time workers participating in such measures benefited from 17% higher initial earnings than the control group. Training measures of shorter duration, on the other hand - many of which consist of crash courses in computing and similar training offers - do not have a significant, measurable and positive impact on income levels. This finding confirms the often expressed - but empirically unproven - concerns about the effectiveness of crash courses of all types for the unemployed and short-time workers in eastern Germany. In many cases the organisers, rather than the participants in such courses - the latter often being forced to attend by the employment offices - are the ones drawing the principle benefits. The Federal Labour Office has already responded to this criticism, by imposing sharp restrictions on financial support for short-duration courses.

## 5. Conclusions

The income effects of interruptions to working life in the context of the transformation process currently under way in the east German economy differ sharply from those typical of "stable" market economies. This is illustrated in a synoptic manner by figure 1, which shows typical income trends for east German male workers<sup>9</sup>. Relative to the level of earned income in May 1989, some respondents whose work careers had been interrupted by unemployment attained an income level significantly above that of those in continuous employment. This, however, is conditional on the individual taking advantage of the break in working life to participate in further training or retraining and who subsequently find work in another firm. The "losers" in our model, as far as income is concerned, are those on short-time

working, who then regain employment in their old firm. Their income position after re-employment is markedly inferior to that of the other two groups.

The fact that, after an interruption, long work experience is no longer rewarded on re-employment clearly hits older east German workers hardest, all the more so as many are simply unable to find a way back into working life. This loss of human capital is to be evaluated against the background of the very flat age-income profile in the former GDR and (still) in the new federal states. This is shown in figure 1 by the fact that no significant rise in income profile can be observed, even for those in continuous employment.

The strong, positive income effect of a job change suggests that two distinct sectors are developing within the east German economy, with a wide productivity gap between them: a contracting sector consisting of the remaining firms still owned by the Treuhandanstalt, and a dynamic sector of newly founded or restructured firms, where pay is more closely linked to productivity.

The finding that only training measures lasting more than six months exert a significant impact on income, while those of shorter duration have no such effect suggests, as many observers have claimed, that many of the courses offered (particularly) in the early stages of the transformation process, were of very doubtful benefit to participants. The policy implication is that the provision of substantive, longer-term measures for the unemployed and those on short time, with a measurable effect on skills and qualifications is to be extended, while support for crash courses of at best dubious benefit is to be strictly limited.

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- 1 Strictly speaking, short-time working is not a break in  
working life - indeed avoiding such a break is the precise  
aim of the instrument. In east Germany, however, short-time  
working is in fact directly comparable to a break due to  
unemployment, as a considerable proportion of those on short  
time are actually working "zero hours".
- 2 A number of studies of the former GDR have already been made  
which are broadly in line with human capital theory (cf.  
Krueger and Pischke 1992 and Schwarze 1993).
- 3 Re-employment of the unemployed in their former place of  
work is rare, although "temporary lay-off" does play a role  
on the east German labour market.
- 4 The income results  $Y_{S90}$  and  $Y_{R5/90}$  are in most cases  
identical as the 1990 survey was conducted almost entirely  
during the month of June. Relevant for the analysis is thus  
 $Y_{S90}$ .
- 5 In addition a model was estimated in accordance with the  
pooled-regression approach without an explicitly formulated  
covariance structure. The results of this estimation, as  
they differ only marginally from those of the error-  
component model, are not presented here.
- 6 This provides basic confirmation of the results obtained by  
Schwarze (1993), despite the fact that the latter study  
considered not the actual, but the institutional duration of  
education and training. It is interesting to note that both  
operationalisations lead to roughly equal income yields,  
whereas Krueger and Pischke (1992), on the basis of  
different, and in most cases shorter, education and training  
periods, derive substantially higher income yields.
- 7 Broadly similar results were obtained by Krueger and Pischke  
(1992) using OLS regressions for the years 1988 to 1991.
- 8 However, this finding is not in accordance with Schwarze  
1993, where a significant, positive correlation between job

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tenure and the income of male workers was established for the GDR (1989).

<sup>9</sup> These income trends are based on the estimated coefficients from tables 2 and 3. Training and work experience correspond to the means of the sample.

Table 1: Means and standard deviations of all variables used  
(East German male workers)

Variable	Continuous Employment		Discontinuous Employment	
	Mean	St.dev.	Mean	St.dev.
Income b1 <sup>1)</sup>	7,08	0,26	7,03	0,26
Income b2	7,19	0,29	7,10	0,27
Income a1	7,72	0,33	7,62	0,34
Income a2	7,77	0,34	7,69	0,34
Years of education	13,16	2,94	12,83	2,79
Work experience b1 <sup>2)</sup>	18,81	12,83	17,37	11,54
Work experience b2	19,72	12,91	18,30	11,62
Work experience a1	20,87	12,84	19,07	11,69
Work experience a2	21,02	12,82	19,18	11,59
Job tenure b1 <sup>2)</sup>	15,03	11,48	13,45	10,16
Job tenure b2	13,57	11,58	13,06	10,45
Job tenure a1	10,41	11,17	7,90	10,41
Job tenure a2	9,27	10,71	6,88	9,78
Job change a1 <sup>3)</sup>	0,32	0,47	0,55	0,50
Job change a2	0,41	0,49	0,62	0,49
Duration of interruption	-	-	5,67	3,79
Last search status unempl. <sup>3)</sup>	-	-	0,29	0,45
Retraining, further training <sup>3)</sup>				
- less than six months	-	-	0,06	0,24
- six months and more	-	-	0,03	0,16
N (persons)	913		562	

1) In logarithm. - 2) In years. - 3) Dummyvariable, 1=yes, 0=no.

b1: May 1989;

b2: Date of interview 1990;

a1: October 1991;

a2: Date of interview 1992;

Source: GSOEP 1990-1992.

Table 2: ML-estimations with alternative covariance-structures  
Income of East German male workers

- continuous employment -

Variable	Coefficients (Standard errors)	
	(1)	(2)
Intercept b1	6,476 (0,050)	6,479 (0,047)
Intercept b2	6,571 (0,049)	6,571 (0,047)
Intercept a1	7,015 (0,045)	7,055 (0,062)
Intercept a2	7,047 (0,045)	7,096 (0,063)
Years of education b	0,037 (0,003)	0,037 (0,002)
Years of education a	0,039 (0,002)	0,041 (0,003)
Work experience b	0,010 (0,002)	0,010 (0,002)
Work experience <sup>2</sup> b /100	-0,018 (0,006)	-0,020 (0,006)
Work experience a	0,015 (0,002)	0,014 (0,003)
Work experience <sup>2</sup> a /100	-0,031 (0,005)	-0,030 (0,008)
Job tenure b	-0,001 (0,002)	-0,001 (0,002)
Job tenure <sup>2</sup> b /100	0,008 (0,005)	0,007 (0,006)
Job tenure a	-0,002 (0,002)	-0,005 (0,003)
Job tenure <sup>2</sup> a /100	0,010 (0,006)	0,014 (0,010)
Job change	0,115 (0,015)	0,020 (0,019)
$\sigma_{\mu}^2$	0,042 (0,002)	0,029 (0,003)
$\sigma_{\alpha v}^2$	-	0,026 (0,002)
$\sigma_{\alpha n}^2$	-	0,062 (0,003)
$\sigma_u^2$	0,034 (0,001)	0,009 (0,001)
ln(L)	50,4	589,09
N (persons) = 913		

(1):  $e_{it} = \mu_i + u_{it}$ .

(2):  $e_{it} = \mu_i + \alpha_{ib} + \alpha_{ia} + u_{it}$ .

b1: May 1989,

b2: date of interview 1990,

a1: October 1991,

a2: date of interview 1992,

b: times b1, b2,

a: times a1, a2.

Source: GSOEP 1990-1992.

Table 3: ML-estimations with alternative covariance-structures  
Income of East German male workers

- discontinuous employment -

Variable	Coefficients (Standard errors)	
	(1)	(2)
Intercept b1	6,315 (0,061)	6,311 (0,055)
Intercept b2	6,388 (0,058)	6,382 (0,054)
Intercept a1	7,056 (0,069)	7,058 (0,113)
Intercept a2	7,114 (0,069)	7,118 (0,115)
Years of education b	0,042 (0,004)	0,042 (0,003)
Years of education a	0,042 (0,003)	0,042 (0,006)
Work experience b	0,009 (0,003)	0,010 (0,003)
Work experience <sup>2</sup> b /100	-0,016 (0,008)	-0,017 (0,007)
Work experience a	-0,004 (0,003)	-0,004 (0,005)
Work experience <sup>2</sup> a /100	0,006 (0,007)	0,009 (0,014)
Job tenure b	0,005 (0,002)	0,005 (0,003)
Job tenure <sup>2</sup> b /100	-0,005 (0,008)	-0,001 (0,009)
Job tenure a	0,010 (0,006)	0,008 (0,010)
Job tenure <sup>2</sup> a /100	-0,011 (0,014)	-0,008 (0,029)
Job change	0,195 (0,047)	0,189 (0,085)
Duration of interruption	-0,019 (0,002)	-0,021 (0,004)
Last search status unempl.	-0,031 (0,014)	-0,058 (0,029)
Retraining, further training		
- less then six months	-0,066 (0,028)	-0,060 (0,063)
- six months and more	0,107 (0,043)	0,171 (0,087)
$\sigma_{\mu}^2$	0,030 (0,002)	0,015 (0,003)
$\sigma_{\alpha v}^2$	-	0,026 (0,003)
$\sigma_{\alpha \eta}^2$	-	0,063 (0,005)
$\sigma_u$	0,036 (0,001)	0,011 (0,001)
ln(L)	49,17	348,35
N (persons) = 562		

(1):  $e_{it} = \mu_i + u_{it}$ .

(2):  $e_{it} = \mu_i + \alpha_{ib} + \alpha_{ia} + u_{it}$ .

b1: May 1989,

b2: date of interview 1990,

a1: October 1991,

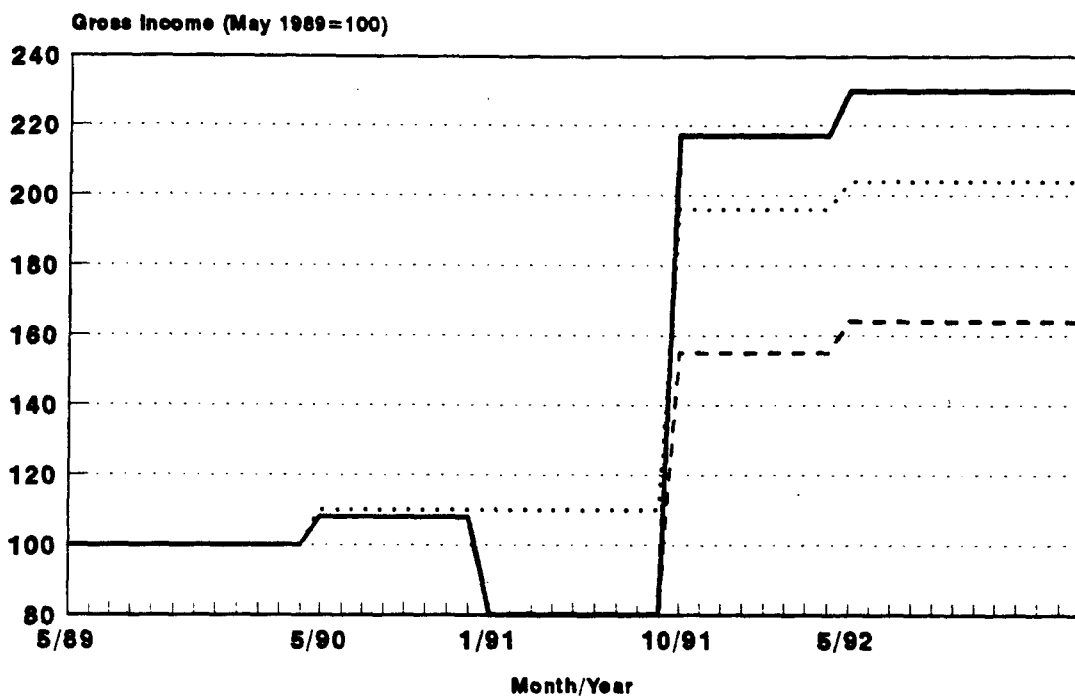
a2: date of interview 1992,

b: times b1, b2,

a: times a1, a2.

Source: GSOEP 1990-1992.

**Figure 1: Income Profiles<sup>1)</sup> for Male Employees in East Germany  
According to Job Continuity**



--- Continuous Job — Unemployment<sup>2)</sup> - - Short Time Working<sup>3)</sup>

1) Simulation based on average Education and Tenure.

2) With Change of Employer and Further Training. 3) Without Change of Employer and Further Training.

Source: GSOEP 1990-1992.