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THE POVERTY TRAP AND THE LAFFER CURVE – WHAT CAN THE GHS TELL US?

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ABSTRACT

The Poverty Trap and the Laffer Curve – What Can the GHS Tell Us?*

Budget constraints are drawn up for annual hours and net pay, typically composed of two linear segments: 'benefit-constrained', where extra work forfeits benefit, and 'normal', where extra work is subject to the standard marginal tax rate. There are additional linear segments for those on upper tax rates. By ordering males according to the ratio of their maximum net earning power to that when totally unemployed, we establish the appropriate cut-off point for the poverty trap and upper rate segments, from which we estimate labour supply responses to slope and intercept variables. The results suggest high substitution elasticities for those who experienced unemployment during the previous year and those on higher incomes; for average employed men the elasticity was quite low. The results suggest that top tax rates were still above the revenue-maximizing point in 1987 and that strong responses would be obtained from measures to increase work incentives among the unemployed.

JEL classification: 820
Keywords: General Household Survey, poverty trap, labour supply, tax rates, labour supply incentives

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NON-TECHNICAL SUMMARY

In previous work we set out the general case for believing that unemployment was caused primarily by the poverty trap, in which the incentive to work (and if working to work hard) is low or non-existent. We reported the results of estimating time-series relationships between wages and unemployment benefits for the UK on annual data, nationally and by industry, and on quarterly data nationally; also on national data for Belgium and West Germany. Subsequently, Davis and Minford (1986) presented new results for Germany; and Minford, Peel and Ashton (1986) produced evidence from pooled cross-section and time-series data on UK regional unemployment.

Yet evidence of this mechanism has not been found in large cross-section data-sets. Researchers have found instead evidence of a modest effect of benefit-income ratios on the duration of job search. Their results differ markedly from what we found in time-series data and from our basic hypothesis, which envisages people *permanently* unemployed or underemployed because the poverty trap affects their permanent opportunities.

Meanwhile, the United Kingdom has experienced rapid growth in circumstances previously associated with high labour demand and much lower unemployment. Furthermore, sociologists have drawn attention to the emergence of an 'underclass', whose members are unemployed permanently and who draw benefits supplemented by income from unofficial work and crime. These observations have strengthened our case and its acceptance in professional and popular debate. But this only serves to heighten the mystery of the weak evidence in cross-section data — including also that of Beenstock et al (1986).

In this study we explore this issue using data drawn from the General Household Survey (GHS) for 1980. We broadened our analysis to investigate incentives generally, since the sample shed light on the behaviour of top-rate taxpayers as well as that of the average citizen. The Laffer curve is a related manifestation of the effects of high marginal tax rates, and it is natural to bracket it with original study of the effects of such high rates on poor people. We also look at the responses of the average employed man, to replicate the results of previous authors such as Brown et al (1987), Ashworth and Ulph (1981), and Blundell and Walker (1986), who found substitution elasticities across a broad spectrum, ranging from 0.01 to 0.5.

The GHS sample we study offers a number of potential advantages. First of course, it represents additional data; so it can add to the information provided by existing estimates. Second, the sub- sample of the unemployed in the GHS data is reasonably large and representative, as is that of probable higher rate taxpayers: Brown et al's 1987 study had few usable observations on either group. Finally, the sample is recent, from a year when top rates had been cut and

unemployment was already high, so that the findings are also likely to be relevant to current conditions.

It would be possible to construct an elaborate intertemporal decision model in which the household chooses hours across different time periods and across all members of the household, and then to derive from it an equation explaining hours worked by males. The data in the GHS cannot permit testing such general hypotheses and therefore to test a much simpler theory that weeks worked by males are explained by maximization subject to the current period's budget constraint. To allow for variations in preferences for leisure we include dummy variables for family size; and to capture the possible effects of future wages we include dummy variables for qualifications. The most important feature of this budget constraint for our purposes is that it consists essentially of two linear segments. The first segment is benefit-constrained, meaning that as the man works an extra week his marginal tax rate includes benefit withdrawal, as he is receiving net pay in place of the supplementary benefit he would have received had he not worked for that week. The second segment is that where the man would not claim supplementary benefit having acquired sufficient income in the week to be ineligible; in this segment the marginal tax rate is simply income tax and National insurance. For someone on standard rate this segment is steeper than the first. (For top earners there will also be higher rate segments, discussed below.)

Men can then be classified by how far the second segment encourages them to 'leap over' the first. A steep second segment is likely to be tangent to a higher indifference curve than the flat first segment. But a shallow second segment could be tangent to a lower curve than the first, causing under-employment; call this a poverty trap constraint.

Our theory suggests that individuals who face the poverty trap constraints are more under-employed in the year of the sample than the rest, that they are less likely to be fully employed in that year, and that the decisions of all individuals are affected by the slope and intercept of the relevant part of their budget constraint.

We make two departures from earlier studies. First, we take the fiscal year (rather that the usual day or week) as the time unit for decision. This permits us to take proper account of tax allowances, which cannot be carried forward; and it allows combinations of weeks of work with weeks of unemployment to enter the budget constraint. Implicitly, we assume that individuals view hours of work as highly substitutable within the year, provided effort is not too highly concentrated. The resulting constraint is much simpler and smoother than in the usual weekly focus, making an important difference to our results. Second, following our procedure in our earlier time-series work, we treat the unemployed man not as engaging in search activities (in any interesting sense) but as choosing, like those who are

employed, an optimum location along his budget constraint. Only about a quarter of the unemployed in our sample have been out of work for the whole of the preceding year; the rest had spent some weeks working. Of course, a number of the employed had similarly been unemployed for some part of the year; and a further number were regularly engaged in part-time work. So we find considerable variation in weeks worked both across the whole sample and among those unemployed for some part of the year. Unfortunately, the GHS is not as precise on weeks worked as we would like; we therefore make assumptions (discussed below) in order to produce estimates which should at least indicate the correct orders of magnitude.

There are two key variables in the study: the number of hours worked in the year and the marginal net wage receivable. The GHS asks the unemployed how long they have been out of work. For those individuals we assume the same 2 hours worked per week for the number of weeks unemployed and normal hours for the others. The procedure gives us estimates of hours in the past 12 months which should at least be reasonably indicative of orders of magnitude. The gross weekly wage from which our net marginal wage is derived is calculated on the basis of each person working a standardized 50 hour week. For the employed this gross weekly wage is simply their hourly rate of pay times 50. For the unemployed we multiply by 50 their potential hourly pay, which we calculate by reference to the average hourly rate of pay of those in employment in the same employment category.

Since individuals do not all face the same region of the segmented budget constraint, we need to find a method of identifying which segment of the constraint an individual does face before we can estimate an equation explaining hours worked as a fraction of the net marginal wage and other variables. Once individuals are sorted into the three groups — those in the poverty trap, normal rate taxpayers and high rate taxpayers — estimation of the labour supply curve is straightforward.

From the gross standardized wage, each individual's net marginal wage (his relevant segment) was calculated according to the following criteria. First we calculated the ratio of each individual's net income in work (for a 50 hour week) to his net income when unemployed. For those in the bottom decile of the distribution of this ratio (for whom there would be little financial advantage from working), the net marginal wage is the difference between their net weekly income from working and their total weekly income from unemployment. For those in the top 5% of the wage distribution, the net marginal wage is calculated as their gross weekly standardized wage, times one minus an appropriate marginal rate (i.e. 60% for the top 0.5%, 50% for the next 1%, 40% for the remaining 3.5%). For the rest of the sample the standardized wage is multiplied by one minus the basic rate of tax and the employees' national insurance rate

(i.e. one minus 0.3625). In other words, each individual is faced either with the decision of whether to work or not (for those with a low ratio of in-work income to out-of work income), or whether or not to work harder (for those for whom unemployment is clearly not an attractive option).

Complementing this net marginal wage is an 'intercept' variable which proxies the 'income potential' of the individual; it is calculated as the point at which his 'relevant' linear budget constraint would place him for a normal year's work. For those in the bottom decile of the in-work/out-of-work ratio, it is therefore the sum of the net weekly income from not working plus 50 times the net weekly marginal (as defined above); while for the rest of the sample it is 50 times net weekly income when employed. In addition to these variables, we include variables which represent education, family size etc.

We could then run regressions using ordinary least squares, which now of course becomes quite appropriate, relating annual work to the marginal wage and intercept given by the relevant segment of the budget constraint determined by our classification procedure; we varied the cut-off points somewhat but found that the classification used above gave the best results.

The estimates of the substitution elasticities vary according to the sub-groups studied, such as those employed all year, those unemployed and higher income groups. Among the employed substitution elasticities (estimated by instrumental variables) are around 0.1. Among the unemployed they are much higher, at about unity, though with a much higher standard error. For higher income groups the elasticities (measured by ordinary least squares, because of poor instrument fits) are also high, ranging from 0.3 to 0.6, with quite a low standard error. Presumably the higher elasticities among the unemployed and the higher income groups reflect the flatness of the indifference curve when the marginal tax rates are as high as they are in the poverty trap.

Previous investigators have emphasized the role of demand variables. Brown et al stress this, identifying many people whose firms would not offer them more work in the given week. We assume in our analysis that during the year of the sample the respondents could have worked as much as they wished at the pay rates they reported (or that we projected for the unemployed). For a given week this is implausible but during a year arrangements can be made, for example, to take extra work in a second job, or to work part-time in one's main job, or to shift to a more demanding main job. We have, however, tested for demand effects in our estimated relationships, in order that these represent supply curves. We examined a wide selection of demand indicators; even though the estimated coefficients for these variables were generally significant and of sensible sign, the inclusion of these variables did not affect the elasticities of labour supply with respect to the net marginal wage and income.

Our estimated substitution elasticities for the average employed man are lower than those in the 1981 study by Ashworth and Ulph but similar to those estimated by Brown et al in 1987 for the pure supply case. A net marginal wage elasticity of 0.1 lies quite comfortably, therefore, inside the range of plausibility. Where we break some new ground is in our analysis of the behaviour of the unemployed and higher rate taxpayers. Previous studies have had little success in explaining the labour supply of either group. We find that both exhibit higher elasticities; these appear to us to be plausible considering the high marginal tax rates faced by such people. That someone should be twice or three times as sensitive to a given change in incentives when his incentives are very poor seems a sensible conclusion.

The results of this study suggest that the most obvious explanation for the recent surge in the tax revenue from top-rate payers could well be the correct explanation. Tax payments rose because of a massive increase in work effort by people previously discouraged by very high marginal rates, giving further support to the relevance of the Laffer Curve. Our analysis also suggests that what is true at the top may also be true for the bottom of the income distribution, tending to confirm our earlier time-series work on the determinants of unemployment.

In previous work (Minford et al, 1985) we set out the general case for believing unemployment was caused primarily by the poverty trap, in which the incentive to work and if working to work hard is low or non-existent. We reported time-series relationships between wages and unemployment benefits for the UK on annual data nationally and by industry, and on quarterly data nationally; also on national data for Belgium and West Germany. Subsequently, Davis and Minford (1986) presented new results for Germany; and Minford, Peel and Ashton (1986) produced evidence from pooled cross-section and time-series data on UK regional unemployment. Layard and Nickell (1985) endorsed our basic views; while arguing that the temporal movement of benefits was not correlated with wages after controlling for other factors (a finding we dispute), they agreed that the benefit system and particularly its loose administration in the 70s created the conditions for wages to be driven above their market-clearing rates.

Yet in the crucial large cross-section data-sets the evidence of this mechanism has not been found. Instead, evidence of a modest effect of benefit-income ratios on the duration of job search has been found; most recently, for example by Narendrathan, Nickell, and Stern (1985). This effect is both quantitatively and qualitatively different from what we found in time-series data and from our basic hypothesis, which envisages people *permanently* unemployed or underemployed because the poverty trap affects their permanent opportunities.

Meanwhile, UK economic developments have shown rapid growth occurring in circumstances previously associated with high labour demand and much lower unemployment. Furthermore, sociologists have drawn attention to the emergence of an 'underclass', whose members are unemployed permanently,drawing benefits supplemented by income from unofficial work and crime. These observations have strengthened our case and its acceptance in professional and popular debate. But this only serves to heighten the mystery of the weak evidence in cross-section data. The most thorough recent work exploring such ideas in these data is that of Beenstock et al.(1986). After examining the budget constraints reported in the Family Expenditure Surveys, they find no effect on the decision to participate in work from the poverty trap.

We chose to explore the GHS 1980, being the most up-to-date sample available at the time we began our work and having the most data on work-related issues. However, as we proceeded our focus widened to issues of incentives generally, since the sample shed light on the behaviour of top-rate taxpayers as well as that of the average citizen; the Laffer curve is an allied manifestation of the effects of high marginal tax rates, and it is natural to bracket it with the original study of the effects of such high rates on poor people.

The most recent work on UK labour supply responses is that of Brown et al (1987) commissioned by HM Treasury; it used a custom-built questionnaire to assess people's reactions to alternative tax rates. Based on these responses the supply elasticity of work to net wage (demand effects absent) was set at about 0.1 if income is held constant (the 'substitution effect'); the supply elasticity of work to

income was set at -0.1 (the 'income effect'). The study's finding on the substitution effect is a lower than that for married men in Ashworth and Ulph (1981), who set the elasticity at between 1/3 and 1/2. It is however higher than that of Blundell and Walker (1986) who in their study of married couples (both working) estimate an (intertemporal) substitution elasticity for men of 0.01 - 0.04

These studies are all encouraging to the idea that tax rates matter at least to some extent for the incentives of the average worker. The income effect may of course partially (totally in Brown et al) offset the substitution effect; but this does not matter for two reasons. First, the welfare costs relate only to the substitution effect (because it is this that causes a discrepancy between the value of marginal work to the employer and its value to the worker). Second, if in its wisdom our government should wish to get people to forgo the income effect and work harder, it is easily arranged by a negative transfer (eg. lowering thresholds while cutting marginal rates).

The GHS sample studied here offers a number of potential contributions. First of course, it is another sample; so it can add to available estimates. Secondly, it contains useful information for our purposes. For example,: the sub-sample of the unemployed is large (about 450) and representative, as is that of top earners likely to be in the higher tax brackets (about 350). Brown et al. had few useable observations on either group.

Finally, the sample is recent, from a year when top tax rates had been cut and unemployment was already high, so that the findings are also likely to be of relevance to current decisions.

The investigation

This study investigates the hours worked by males in the 1980 GHS. It does so using standard classical theory, with the individual maximising utility subject to his budget constraint.

We make two main departures from earlier studies. We take the fiscal year (rather than the usual day or week) as the time unit for decision. This both permits tax allowances, which cannot be carried forward, to be included appropriately; and it allows combinations of weeks of work with weeks of unemployment to enter the budget constraint. Implicitly, we are treating intra-year hours of work as highly substitutable intertemporally, provided effort is not too highly concentrated (discussed practically below). The resulting constraint is much simpler and smoother than in the usual weekly focus, making an important difference to our results.

Secondly, following our procedure in our earlier time-series work, we treat the unemployed man not as searching in any interesting sense but as choosing an optimum location along his budget constraint just like the employed. Only about a quarter of the unemployed in our sample had been out of work for the whole of the preceding year; the rest had spent some weeks working. Of course, a number of the employed had similarly been unemployed for some part of the year; and a further number were regular part-timers. So we find considerable variation in weeks worked both across the whole sample and among those unemployed for some part of the year.

Unfortunately, the GHS is not as precise on weeks worked as we would like; we make assumptions detailed below to produce estimates which should indicate orders of magnitude.

Theory

It would be possible to construct an elaborate intertemporal decision model for the household (in which they trade off possibilities for work in the future and by all members of the household) and derive from it the particular equation of choice for males. But the data in the GHS are not suitable for testing generalised intertemporal hypotheses. And Apps and Rees (1987) rightly warn against treating the household as a single 'individual' maximising a joint utility function for al family members. We take the simpler, alternative route of treating the male as an individual, subject to a predetermined environment (family, wife's decisions, education, and so on).

We propose therefore to test the simplest hypothesis: that weeks worked are explained by maximising subject to the current budget constraint, as if it is static- the standard diagram of Fig.1. To allow for variations in preferences for leisure we include dummy variables for family size. To capture the possible effects of future wages we include dummy variables for qualifications. And to allow for the effect of wives' decisions we include a dummy variable for a working wife. We also included a separate variable (times the dummy) for wife's earnings but this turned out to be quite insignificant and was dropped.

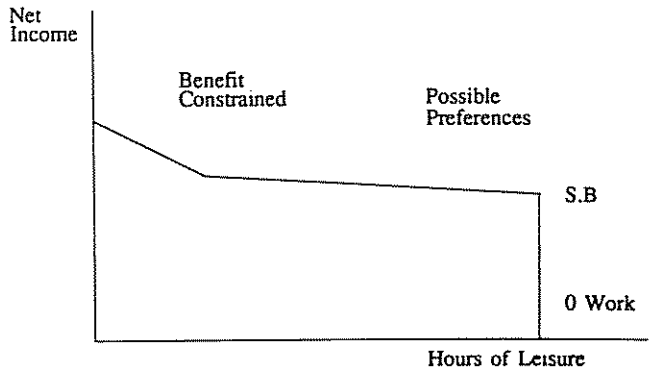
Work decisions take place in an institutional framework. Tax/benefit systems are one part. Overtime and part-time possibilities are another. Apart from tax thresholds, the key tax/benefit aspect is the supplementary benefit provisions; S.B. is payable on a weekly basis subject to readily spendable assets not exceeding a certain level (£2000 in 1980) and on that week's other income not exceeding £4. So if one is unemployed for a week, one is entitled to S.B. even though one may get a job next week or had one last week. The worktest was effectively not applied at the time of our sample.

It is true that in principle voluntary quitting leads to the loss of unemployment (though not supplementary) benefit for 6 weeks; so this might deter flexible use of unemployment spells within the year. But in practice quitting can be arranged to appear involuntary with a cooperative employer who thereby obtains cheap labour. Furthermore, unskilled work is often performed on a temporary basis anyway, so that quitting may not arise. Supplementary benefit will in any case top up a man's loss of unemployment benefit to his s.b. entitlement which is our assumption for benefit in this study. This leaves prosecution as the only viable deterrent. But prosecution for violation of these worktest rules was virtually non-existent at this time;there were in fact two cases in 1980.

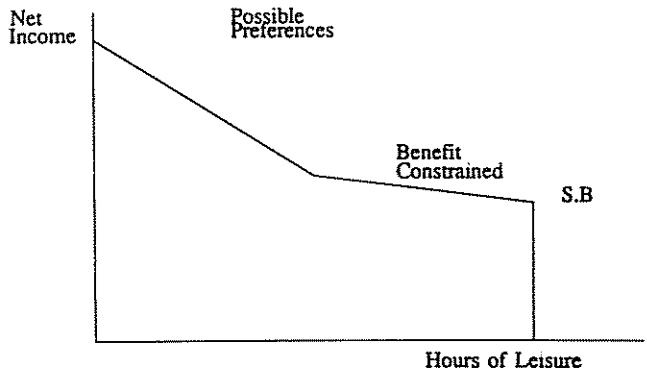
Overtime is not generally within the control of the individual; his firm offers overtime opportunities to its workers on a conventional basis that workers do it when needed. So we treat a certain amount of overtime as part of a typical week.

Part-time work is regulated by the nature of the job. For certain jobs -unskilled ones for example- it may not matter much that the job is being shared among a shifting number of people; they are interchangeable at short notice. For others - highly trained computer programmers or business executives for example- the work may well need to be allocated carefully to match skill with task; the worker needs to commit himself to doing a certain set of hours regularly. By contrast the worker of the first type can please himself more whether he does 10, 20, or 30 hours a week. We assume that this constrains a man with skills to work for the whole year either part-time for 20 hours or full-time; a discontinuity imposed by the transaction costs of swapping workers especially without warning. The unskilled worker we assume to be unconstrained in this way.

FIGURE 1



(1) The Poverty Trap Case



(2) The Average Skilled Worker Case

However, our results turn out to be fairly insensitive to these assumptions for reasons discussed below. The key fact when we construct the budget constraints is how they basically each consist of two linear segments. The first segment is benefit-constrained, meaning that as the man works an extra week his marginal tax rate includes benefit withdrawal, as he is receiving net pay in place of S.B. had he not worked for that week. The second segment is that where the man could not claim S.B., having acquired sufficient income in the week to be ineligible; in this segment the marginal tax rate is simply income tax and National insurance. For someone on standard rate this segment is steeper than the first.

Men can then be classified by how far the second segment encourages them to 'leap over' the first. A steep second segment is likely to be tangent to a higher indifference curve than the flat first segment. But a shallow second segment could be tangent to a lower curve than the first, causing underemployment; call this a poverty trap constraint. Figure 1 illustrates some possibilities.

What we expect to find is that those with poverty trap constraints are more underemployed in the year of the sample than the rest,that they are less likely to be fully employed in that year, and that the decision of all is affected by slope and intercept of the relevant part of their constraint.

In the rest of this paper we look first at the data before setting out our results from tests of these specific hypotheses.

The data:

There are two key variables in this study: the number of hours worked in the year, and the marginal net wage receivable. Their construction requires careful description.

The GHS asks employed people if they have been in their present job for less than three months and if so whether they were unemployed 12 months prior to the interview. If so unemployed and if they had no other employment in between time, their yearly hours are calculated as 7 weeks (roughly half of 3 months) times normal weekly hours. If employed in between time this is indicated, but the length of employment is not. In these cases we have had to assume an insignificant period of unemployment.

The GHS also asks if employed more than 3 months but less than 12 months in the present job and if so whether unemployed 12 months ago. Here we assume 32 weeks of normal hours for those with no intervening employment, otherwise a full year's normal hours. In all these cases, we assume that when unemployed, people do the maximum casual hours work permitted without loss of benefit (approximately 2 hours per week).

The GHS asks the unemployed how long they have been out of work. For these we assume the same 2 hours per week for the (average) number of weeks unemployed and normal hours for the others. Noone in the sample therefore works zero hours by assumption, enabling us to use the logarithmic transformation.

The procedure gives us estimates of hours in the past 12 months which should at least be reasonably indicative of orders of magnitude. The lack of precision does however highlight the need for explicit GHS questions on hours worked over the past 12 months and ideally also over the last fiscal year.

The gross weekly wage from which our net marginal wage is derived is calculated on the basis of each person working a standardised 50 hour week. For the employed this is simply their hourly rate of pay times 50. For the unemployed, their *potential* hourly pay is multiplied by 50. This potential hourly rate is calculated by reference to the average hourly rate of pay of those in employment in the same SEG category as the unemployed. These hourly rates are then multiplied by 0.82, being the ratio of the recently unemployed's pay rate (some information is given in the GHS) to that of the employed's current rate of pay.

From this gross standardised wage, each individual's net marginal wage was calculated according to the following criteria. First we calculated the ratio of each individual's net income in work (for a 50 hour week) to his net income when unemployed. For the poverty trap segment of the budget constraint, the net marginal wage is the difference between net weekly income from working (inclusive of Family Income Supplement and related in-work benefits) and total weekly income from unemployment benefits (assumed to be on the short term supplementary benefit rate). Benefits were calculated from the official rates prevailing in 1980, given the relevant household characterstics in the GHS data.

For the standard rate segment, net marginal wage is calculated as their gross weekly standardised wage times one minus the basic rate of tax and employees' national insurance rate (i.e. 1-0.3625). For high earners, there are also a number of top rate segments, which are calculated analogously with the appropriate tax rate. The estimates made of each person's marginal tax rate are based on his standardized wage times his estimated annual hours, plus his non-wage income; no allowance is made for mortgage, insurance, pension, or bonuses. Wife's earnings are also excluded.

Apart from these variables, we enter a number of the usual control variables for education, family size and so forth.

In determining where these budget segments begin and end, we have had to make somewhat arbitrary decisions, as discussed earlier,both about the restrictions on part-time work and the ordering of personal preferences (or institutional costs or restrictions with the same effect) over hours and weeks.

With part-time work, we assume that unskilled workers do not work part time but rather choose to work full weeks for part of the year. This seems probable since a part-time week's wage loses supplementary benefit pound for pound. We assume that skilled workers however are restricted from choosing to work full weeks for part of the year; for them the choice is to work part-time all year or to work full time with 50 or more hours. This restriction has the effect both of shortening their benefit-constrained segment and of flattening its slope.

As for hours and weeks, we assume that a full-time worker works a 50 hour week for a specified number of weeks and increases the number of weeks until he reaches a full year's quota of 52; from this point he increases hours by working existing weeks for longer hours.

It could be that a worker prefers to work longer-hour weeks for less than the full year (for example, a 60-hour week for 10 weeks rather than a 50-hour week for 12). If so, this would both lengthen his benefit-constrained segment and steepen somewhat the slope of this segment.

Clearly, these assumptions introduce potential errors into our slope and intercept regressors. As will become apparent, the lengths of the segments do not matter for our results. Their slopes and inter-

cepts do matter, but the perhaps minor errors introduced here can be prevented from causing errors-in-variables or endogeneity bias through IV estimation.

Results

We turned first to an examination of the likelihood of a man being unemployed at all in the year, expecting this to be positively related to the poorness of his constraint.

We relate the relative frequency of being fully employed (relative to being unemployed for some part of the year) to a summary measure of the whole budget constraint, DANMARG; this is obtained by piecing together each man's budget constraint in segments and computing the average net marginal wage across all potential hours (for example a man with two segments, the first over 1500 hours with slope of £4000 per year and the second over 2000 hours with slope of £10000 per year, would have an average slope of £7428). We add some relevant control variables: age (less or more than 26), family status (single, married,married with children), education, and occupational status (SEG group-skilled or not- see table 3 glossary). Interactions of these variables with each other and with DANMARG were fully investigated and all significant ones retained.

The results are in Table 1. It can be seen that DANMARG is significant in explaining the likelihood of unemployment as expected. Indeed the rise in probability of unemployment as the constraint worsens is dramatic, as shown in the bottom half of the table. For example, a skilled married man with children and with low education, aged less than 26 and in the lowest third of the budget constraint distribution is four times more likely to have been unemployed sometime during the previous twelve months than one in the highest third. There are some interesting variations in this pattern, reflecting the interaction terms. Thus among the single men in the lowest 33% of the budget constraint distribution there is a relatively low probability of unemployment. For young single men this is understandable; they will be working effectively as trainees, receiving an implicit supplement to their wage and so a better than calculated budget constaint. For those with high education this supplement is presumably worth a lot and for these it is a strong effect. For single men over 26 the effect is not marked among those who are heads of households; their behaviour is very like those in the middle third of budget constraints. However, among those of them who are not heads of household it remains marked; and this may reflect continued training among this group.

This is powerful evidence of a poverty trap effect on participation. But we should be able to go further and quantify the effect on hours worked of varying incentives.

To identify the slope and income effects we need to pin down a unique measure of slope and of intercept for each man's budget constraint. This seems impossible because the slope changes with hours worked, as Fig.1 shows.

But it shows too that the budget constraints over the fiscal year have a simple, basically two-segment form.The fiscal year focus together with natural institutional limits serve to simplify and smooth the constraint compared with that observed when the focus is on weekly or daily hours. Take daily hours for example where the day is treated as a normal day in the worker's year or life . At 0 the constraint has a spike as benefit is lost for any work. Then the slope reflects the tax threshold and normal pay; then normal pay less standard rate. Next, overtime less standard rate. Finally, any moonlighting possibilities less tax. Such a curve may have even for an average paid worker as many as two kinks and 3 or 4 slopes (see for example fig.3.5 on p.114 of Beenstock et al., 1987). Yet the choices facing such a worker are at once more flexible and more limited as we have argued.

Table 1: Probability of Being Unemployed During Year (standard errors in parenthesis)

Dependent variable is log of (frequency of being employed all year/frequency of being unemployed during year):

(DANMARG)

	Constant	Single	Married without children	Age<26	Lowest 33% of earners	Middle 33% of earners	High education	Unskilled	
equation	1.057	-0.001	0.109	-0.096	-0.208	-0.186	0.055	-0.291	
	(0.101)	(0.105)	(0.079)	(0.040)	(0.059)	(0.052)	(0.028)	(0.027)	
	Non-head of h'hold (HOH)	Young/ single	Young/ married, no children	Single/ low wage	Single/ middle wage	Married no chldn/ low wage	Married, no chldn/ middle wage	Single/ high ed.	Married, no chldn/ high ed
	-0.247	0.065	0.073	0.256	-0.117	-0.276	0.01	0.061	-0.134
	(0.101)	(0.052)	(0.062)	(0.084)	(0.069)	(0.076)	(0.070)	(0.037)	(0.040)
	Young/ low earner	Older/ low earner	Single/ non-HOH	Married, no chldn/ non-HOH	Low wage/ non-HOH	Middle wage/ non-HOH	No. in sample		
	0.192	-0.031	0.216	-0.024	0.225	0.019	7122		
	(0.059)	(0.045)	(0.117)	(0.000)	(0.079)	(0.063)			

This regression can best be understood by a Table showing the Expected Frequency (i.e. Probability estimated) of being unemployed during the year (Prob U/E)

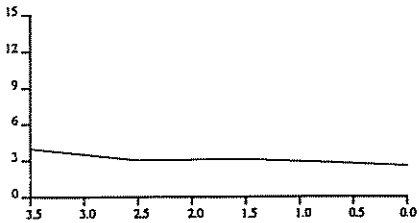
Average net marginal wage (DANMARG)

		Lowest 1/3	Middle 1/3	Top 1/3
Single Age < 26				
unskilled,	low educ,non-HOH	10.8	44.3	23.3
	HOH	20.9	43.1	9.2
	high educ,non-HOH	7.1	33.3	16.0
	HOH	.	32.3	6.0
unskilled,	low educ,non-HOH	3.7	19.9	8.7
	HOH	7.6	19.1	3.1
	high educ,non-HOH	2.3	13.5	5.6
	HOH	4.9	13.0	2.0
Single Age > 26				
unskilled,	low educ,non-HOH		38.4	12.3
	HOH	33.5	37.2	4.5
	high educ,non-HOH		28.1	8.1
	HOH	24.1	27.2	2.9
skilled	low educ,non-HOH	6.8	16.3	4.2
	HOH	13.6	15.6	1.4
	high educ,non-HOH	4.4	10.9	2.7
	HOH	9.0	10.4	0.9
Married, no children, Age < 26[1]				
unskilled,	low educ,HOH	15.6	12.3	2.8
	high educ,HOH		16.1	3.8
skilled,	low educ,HOH	5.5	4.2	0.9
	high educ,HOH	7.3	5.7	1.2
Married, no children, Age > 26[1]				
unskilled,	low educ,HOH	26.7	10.2	1.4
	high educ,HOH	33.3	13.4	1.8
skilled,	low educ,HOH	10.2	3.4	0.4
	high educ,HOH	13.5	4.6	0.6
Married with children, Age < 26[1]				
unskilled,	low educ,HOH	33.0	18.0	10.2
	high educ,HOH	22.8	11.6	6.3
skilled	low educ,HOH	13.3	6.4	3.4
	high educ,HOH	8.4	4.0	2.1
Married with children, Age > 26[1]				
unskilled,	low educ,HOH	29.4	7.1	2.3
	high educ,HOH	19.9	4.4	1.4
skilled,	low educ,HOH	11.5	2.3	0.7
	high educ,HOH	7.2	1.4	0.4

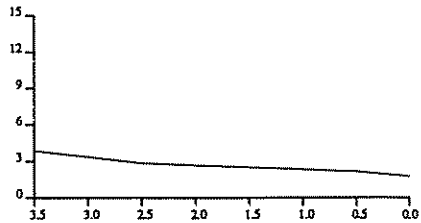
[1] non-HOH not shown for these categories as very few cases observed.

Figure 2: Budget Constraint For 6 GHS Sample Individuals
(Vertical axis: Net Income (£000 p.a), Horizontal axis: Hours worked ('000 p.a))

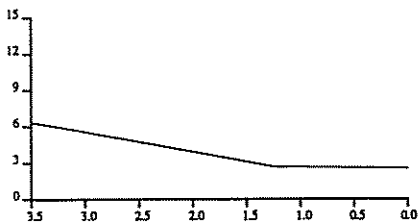
Lower Income Individual



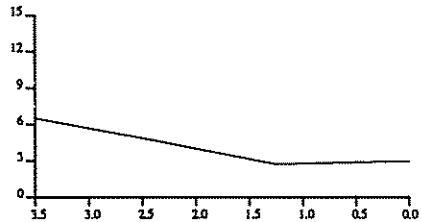
Lower Income Individual



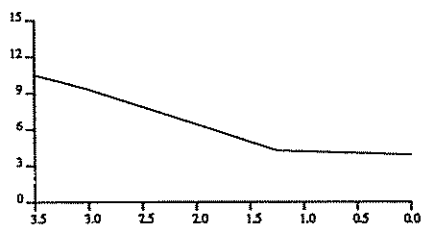
Middle Income Individual



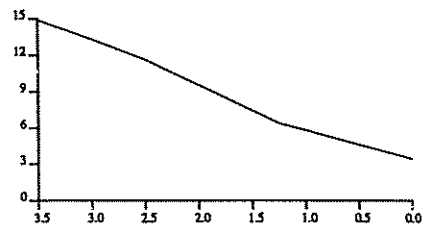
Middle Income Individual



Higher Income Individual



Higher Income Individual



We have only briefly discussed the higher rates of tax (and the ceiling on national insurance). These introduce extra segments with altered slope beyond the standard one. We can include them on a variant of the argument which follows.

Suppose a typical person with a typical indifference map. His budget constraint will be tangent to it in a region which reflects the overall nature of the constraint in a way that can be easily characterised. If he has low pay his constraint will be dominated for most of its length by the benefit-affected portion; and the rest will lift his consumption little above its level on this portion. His tangency point is likely to be on this portion. With high pay, this portion will be small and he is likely to be tangent on the normal portion. Thus if we can sort men into the two groups we can identify their unique slope and intercept terms.

What of higher rate payers? Again we can look for a sorting device to locate the relevant portion of their constraint. Once sorted again we can identify slope and intercept.

A look at the budget lines of randomly selected men shown in Figure 2 reveals their typical simplicity and how like they are to our stylised pictures in Fig.1. It is obvious enough that for the worker in the poverty trap the point of tangency between his indifference map and his budget constraint will probably lie along the benefit-constrained portion.

The sorting device we suggest is therefore the ratio of maximum to minimum consumption, ie. the left hand intercept divided by the right hand on our figure. This measures the extent to which the overall constraint rewards extra work with net income. Our suggestion is that below some cut off point in this ratio men will behave as if the relevant constraint is the benefit-affected portion. Equally above some high cut off they will behave as if the relevant portion is the top tax rate section of their constraint. In between they are assumed to be affected by the central standard rate section of their constraint. Note that these cut off criteria are totally independent of their actual decisions on hours.

A natural criterion for choosing those on the top rate segment is whether their earnings are such that with a normal year's work they would pay higher rates of tax; those in this category are the top 5% in estimated income. Notice that, to avoid selection bias, these bands use standardized earnings for normal hours (plus non-wage income) and not actual earnings which could reflect actual hours worked. So we choose a cut-off embracing the top 5% of our sample. Within this group, we order as follows: the top 1/2% at the 60% marginal rate, the next 1% at 50%, and the last 3 1/2% at 40%.

(The estimated distribution of top rate payers across the actual bands was: 0.3%-60%; 0.2%-55%; 1%-50%; 1 1/2%-45%; 2%-40%.) Sensitivity tests around our chosen cut-offs gave best results for these.

As for those on the benefit-affected segment, we can be less definite because we do not know what leisure preferences are for men in the poverty trap. It is entirely possible for example that all unskilled men will not work all the 50 normal (50 hour) weeks per year- or 2500 hours- that would enable them to break out above the benefit-affected portion of their constraint. We proceed by searching over cut-off points in the relevant region.

Using these cut-offs we run regressions in ordinary least squares, which now in principle becomes appropriate, relating annual work to marginal wage and (upper) intercept along the relevant segment,chosen by the above classification; the intercept with the vertical axis is computed as total in-

come (including non-earned) enjoyed with 50 weeks of work along his relevant budget constraint segment. The results are in Table 2.

The regressions were run both by OLS and IV, to control for possible bias from errors in variables and omitted variables correlated with hours. (IV on wife's earnings made no difference to the results and is not reported.) For the full sample, it is possible to obtain quite a good set of instruments to explain standardised earnings, the key variable entering slope and intercept calculations. The R^2 between earnings and instruments is 0.34. Consequently these IV estimates may possibly be more reliable than their OLS counterparts, even though there is a loss of variation from the earnings figures. It is rather interesting that IV for the full sample, the employed, and the unemployed, using these full sample IV estimates of earnings, all give markedly higher estimates of slope coefficients than OLS.

The use of IV for the sub-samples of top earners is likely to be less reliable because the R^2 of the first stage regressions of earnings on instruments for these groups (estimated separately for closest fit) drops to 0.18 or less (0.12 and 0.15 for top 10% and 5% respectively). Even so, the slope coefficients do not change a great deal for the top 20% and 30% where the sample is still large. The IV results for the top 10% and 5% show a drop in slope elasticity to 0.2; these groups may in any case cover too narrow a wage spectrum and too small a sample to be useful and representative of potential top earners as a group.

It turns out that a lower cut-off at the bottom 10% gives the best results in general. So these are the ones reported here. What is interesting is the way the estimates of the elasticities vary as the sample shifts between all and sub-groups such as the employed all year, the unemployed and higher income groups. Among the employed net (IV) wage elasticities drop to 0.13 from 0.37 for the whole sample. Among the unemployed they are much higher at about 1.0 though with a much higher standard error. For higher income groups (on OLS) they are high too at 0.3 to 0.6 with quite a low standard error (from 0.05 to 0.1).

Notice that we are estimating elasticities and not, as many of the previous authors cited, attempting to estimate the parameters of utility functions. Thus some of our males may be at corner solutions (for example, the unemployed); their behaviour will condition the elasticities estimated, entirely as intended. Indeed they are a key part of our elasticity hypothesis; the fact that they are at a corner does not bias our estimate as it could bias utility function estimates if not properly allowed for.

One feature requiring comment is the role of demand- of which Brown et al make a great deal, identifying many people whose firms would not offer them more work in the given week. We assume here that during the year of sample the respondents could have worked as much as they wished at the pay rates they reported (or we projected, for the unemployed); for a given week this is implausible but during a year arrangements can be made for example to take extra work in a second job, or to work part-time in one's main job, or to shift to a more demanding main job. This is plausible enough especially if he can anticipate his budget constraint. We have however tested for demand effects in these relationships which we take to be supply curves.

This aspect is worth dwelling on carefully. There is no alternative to assuming that the individuals in our sample are each a pricetaker; possibly one or two with exceptional talents may have monopoly power, but we can ignore them in this large sample. Nevertheless, it is possible that the wages they report apply to only a set number of hours, beyond which another lower (or higher) wage applies. This is strictly what must be meant by demand effects in this context: there is a kink in the individual's demand curve at a certain quantity, representing the demands of the industry he is in.

Table 2 (a): Hours Worked (standard errors in parenthesis) OLSQ Regressions

Dependent variable is (log of) Hours worked in the year (as a proportion of maximum annual hours)

Sample	Independent Variables (logarithms of)			Dummies										
	Net`` Marginal Wage	Income* Indicator	Earning wife	Single	M+1	M+2	M+3	M+4	O levels	A levels	Degree	Constant	R	No. in sample
All	0.190 (0.037)	-0.205 (0.038)	0.080 (0.013)	-0.069 (0.017)	0.052 (0.017)	0.064 (0.017)	0.050 (0.025)	-0.052 (0.041)	0.074 (0.016)	0.057 (0.013)	0.036 (0.022)	-0.063 (0.163)	176	7119
All employed (at time of sample)	0.029 (0.019)	-0.066 (0.019)	-0.010 (0.007)	-0.060 (0.009)	0.033 (0.009)	0.039 (0.009)	0.052 (0.013)	0.010 (0.021)	0.004 (0.008)	-0.009 (0.007)	-0.041 (0.011)	-0.392 (0.083)	234	6627
All employed (throughout previous year)	0.013 (0.017)	-0.055 (0.017)	-0.011 (0.006)	-0.054 (0.008)	0.034 (0.008)	0.037 (0.008)	0.048 (0.012)	0.010 (0.019)	-0.004 (0.007)	-0.015 (0.006)	-0.042 (0.010)	-0.398 (0.075)	275	6529
All unemployed (at time of sample)	0.872 (0.389)	-0.711 (0.383)	0.542 (0.154)	0.219 (0.151)	0.070 (0.196)	0.443 (0.194)	0.582 (0.275)	0.677 (0.414)	0.350 (0.146)	0.231 (0.137)	0.303 (0.306)	-0.007 (1.641)	274	492
All unemployed (at some time in previous year)	0.720 (0.324)	-0.606 (0.321)	0.521 (0.126)	0.189 (0.131)	0.022 (0.165)	0.345 (0.163)	0.441 (0.219)	0.568 (0.320)	0.388 (0.124)	0.208 (0.118)	0.308 (0.238)	-0.166 (1.371)	274	590
Top 30% of earners	0.513 (0.053)	-0.463 (0.052)	0.001 (0.013)	-0.016 (0.022)	0.051 (0.018)	0.061 (0.016)	0.113 (0.024)	0.080 (0.046)	0.026 (0.019)	-0.005 (0.016)	-0.034 (0.019)	0.758 (0.263)	238	2135
Top 20% of earners	0.526 (0.063)	-0.401 (0.059)	0.006 (0.017)	0.005 (0.028)	0.059 (0.022)	0.086 (0.020)	0.113 (0.031)	0.113 (0.054)	0.014 (0.026)	-0.026 (0.022)	-0.043 (0.019)	0.124 (0.321)	258	1423
Top 10% of earners	0.572 (0.087)	-0.318 (0.082)	0.040 (0.026)	0.090 (0.044)	0.089 (0.035)	0.114 (0.031)	0.140 (0.045)	0.197 (0.108)	0.052 (0.047)	-0.036 (0.038)	-0.013 (0.038)	0.943 (0.506)	313	712
Top 5% of earners	0.277 (0.103)	-0.205 (0.104)	0.016 (0.035)	0.024 (0.064)	0.094 (0.048)	0.056 (0.043)	0.127 (0.061)	0.291 (0.222)	0.071 (0.070)	-0.011 (0.057)	0.048 (0.055)	-0.462 (0.740)	244	356

*This proxy for each man's income potential is the net income earned for 50 weeks' work, except for the low income group where it is S.B. plus 50 x NMW

**Defined as follows (1) For approx. the bottom 10% of earners, NMW = extra net income for one week's work minus S.B. for one week (benefit-constrained portion of budget constraint). (2) For approx. the top 5% of earners, NMW is the extra income for one week times (1-0.6) for the first 0.5% of earners; times (1-0.5) for the next 1% of earners; and times (1-0.4) for the other 3.5%. (3) For the rest, NMW = extra income for one week times (1-0.3675)

Table 2 (b): Hours Worked (standard errors in parenthesis) Inst. Vars Regressions

Dependent variable is (log of) Hours worked in the year (as a proportion of maximum annual hours)

Sample	Independent Variables (logarithms of)			Dummies										
	Net** Marginal Wage	Income* Indicator	Earning wife	Single	M+1	M+2	M+3	M+4	O levels	A levels	Degree	Constant	R	No. in sample
All	0.369 (0.056)	-0.340 (0.053)	0.073 (0.013)	-0.061 (0.017)	0.055 (0.017)	0.067 (0.017)	0.050 (0.025)	0.041 (0.044)	0.060 (0.016)	0.036 (0.014)	0.001 (0.024)	0.318 (0.220)	175	7039
All employed (at time of sample)	0.127 (0.030)	-0.155 (0.029)	-0.015 (0.007)	-0.071 (0.009)	0.033 (0.009)	0.041 (0.009)	0.048 (0.013)	0.008 (0.023)	0.001 (0.009)	-0.013 (0.007)	-0.048 (0.012)	-0.054 (0.118)	196	6596
All employed (throughout previous year)	0.112 (0.027)	-0.143 (0.026)	-0.017 (0.006)	-0.064 (0.008)	0.035 (0.008)	0.040 (0.008)	0.046 (0.012)	0.011 (0.021)	-0.007 (0.008)	-0.020 (0.007)	-0.053 (0.011)	-0.077 (0.107)	214	6488
All unemployed (at time of sample)	1.037 (0.456)	-0.823 (0.412)	0.522 (0.159)	0.202 (0.153)	0.013 (0.200)	0.280 (0.192)	0.232 (0.248)	0.715 (0.479)	0.351 (0.159)	0.190 (0.151)	-0.133 (0.395)	0.204 (1.704)	259	453
All unemployed (at some time in previous year)	1.140 (0.389)	-0.953 (0.353)	0.502 (0.128)	0.164 (0.131)	-0.014 (0.167)	0.230 (0.163)	0.206 (0.211)	0.691 (0.371)	0.392 (0.132)	0.172 (0.130)	0.047 (0.284)	0.941 (1.479)	276	551
Top 30% of earners	0.433 (0.065)	-0.355 (0.058)	0.003 (0.014)	-0.004 (0.023)	0.053 (0.018)	0.060 (0.017)	0.106 (0.025)	0.075 (0.047)	0.028 (0.019)	-0.004 (0.016)	-0.040 (0.022)	0.175 (0.368)	192	2123
Top 20% of earners	0.415 (0.077)	-0.251 (0.070)	0.010 (0.017)	0.021 (0.030)	0.064 (0.023)	0.086 (0.021)	0.108 (0.032)	0.121 (0.055)	0.019 (0.026)	-0.023 (0.022)	-0.048 (0.025)	-0.698 (0.517)	201	1413
Top 10% of earners	0.215 (0.101)	-0.136 (0.104)	0.046 (0.027)	0.087 (0.048)	0.101 (0.037)	0.122 (0.032)	0.151 (0.047)	0.192 (0.112)	0.055 (0.049)	-0.035 (0.040)	-0.011 (0.039)	-0.818 (0.923)	215	705
Top 5% of earners	0.196 (0.120)	-0.112 (0.138)	0.022 (0.036)	0.038 (0.069)	0.105 (0.049)	0.061 (0.044)	0.128 (0.062)	0.300 (0.224)	0.077 (0.072)	-0.008 (0.059)	0.050 (0.057)	-0.930 (1.283)	219	353

*This proxy for each man's income potential is the net income earned for 50 weeks' work, except for the low income group where it is S.B. plus 50 x NMW

**Defined as follows (1) For approx. the bottom 10% of earners, NMW = extra net income for one week's work minus S.B. for one week (benefit-constrained portion of budget constraint) (2) For approx. the top 5% of earners, NMW is the extra income for one week times (1-0.6) for the first 0.5% of earners; times (1-0.5) for the next 1% of earners; and times (1-0.4) for the other 3.5%. (3) For the rest, NMW = extra income for one week times (1-0.3675)

***Instruments used: SEGs(1-19), LREL7580, educational dummies, household type dummies. Instrumental variables applied to individual's standardised earnings only. For all except top earners I.V. estimates of this derived from regression over full sample. For top 30%, 20% 10% and 5%, I.V. estimates derived from regressions over top 30%, 20%, 10% and 5% respectively R^2 in I V regression on earnings were as follows: full sample 336; top 30% 175; top 20% 141; top 10% 120; top 5% 151

These demand effects could take a variety of forms-illustrated in Figure 3. For example, overtime wages on which we do not have good information could depend on the industry's state. Or the industry may have limited work on hand because of poor demand, and the true marginal wage to our worker is a lower one outside the industry. Yet another possibility is the 'civil service' model, where the senior administrator is expected to work long hours for his higher salary; if he fails to do so, the sanctions are no further promotion, possibly even demotion. This can be thought of either as a lower kink in the demand curve or perhaps more naturally as a missing argument in his supply curve, representing his loss of future income by working less.

(Unionisation could have an analogous effect. A heavily unionised industry will face limits on output and employment. The worker in such an industry who wants to work more must go outside, to a lower non-unionised job. However, experiments with this variable yielded nothing significant).

A wide selection of demand indicators were looked at -Table 3. These included a whole battery of possible proxies - SEG and industry group dummies, and measures of the movement since 1975 by industry of output, wages, employment and unemployment (data from New Earnings and industry surveys). However, though generally significant and of sensible sign (wages had a negative sign,presumably reflecting industry cost effects on labour demand), these variables do not affect the supply elasticities of Net Marginal Wage and income; hence our normal case men in the sample are apparently a distinct subset whose behaviour is independent of the men who are on kinks in their demand curve. This result makes sense in terms of Fig.3, since we would not find any supply response from people at a kink, but we should improve our explanation of their behaviour by variables correlated with the position of the kinks.

We should pause finally to consider other possible omitted variables. We noted at the outset the limited treatment of intertemporal substitution. To this we should add the failure to allow for dynamics; effectively all our men are assumed to be on their long run supply curve, though clearly their recent past must affect their decisions.

Proper treatment of wives too in a household opportunity set is a major undertaking which awaits further research with this data. But it would perhaps be surprising if the rather robust results reported here were altered substantially.

Intertemporal substitution is assumed here to be infinite within the fiscal year; outside it, we rely on proxies for future income, such as extent of training. Possibly, our SEG occupational dummies also pick up some effects of this sort. The GHS gives no other data on future opportunities. Nevertheless, there is no reason to believe that if we were to allow for it, such data would disturb our results; for it to do so differential future/current earnings would have to be correlated with current earnings net of the effects of other factors such as age, occupation and training. There is not to our knowledge any evidence or theory pointing this way.

To assume infinite intra-year substitution and no dynamics is clearly over-simplified. Short-term dynamics could again be partly picked up by our demand, industry and occupational dummies, since these cover the major environmental sources of surprises. Including the rest (presumably purely individual dynamics) in the error term, as with future earnings, does not seem likely to generate bias.

As for substitution, it is important to realise exactly what role it is playing in our empirical work. Essentially, it does two things. First, it enables us to give plausibility to the idea of someone choosing his hours flexibly across a full range without meeting large kinks (other than those arising from our

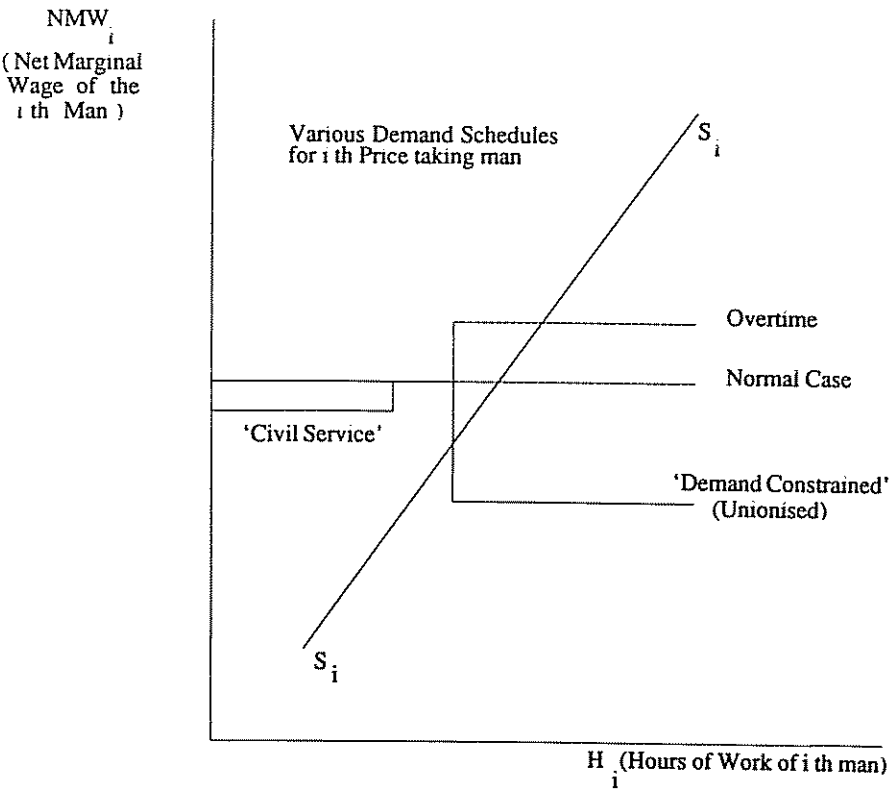


Figure 3 'Demand Effects'

Table 3: Effects of Including Demand Variables (standard errors in parenthesis)

(a) Sample: All
Dependent variable: Log (Hours worked in year as a proportion of maximum hours worked)

Independent Variables (logarithms of)		Dummies			Demand Variables (logarithms of)					
Net Marginal Wage	Income Indicator	DWIF	SEG	IND	Wage	U/E	EMP	OUTPUT	R	No. in sample
0.190 (0.037)	-0.205 (0.038)	0.080 (0.013)							.176	7119
0.186 (0.036)	-0.201 (0.037)	0.088 (0.013)	*						.254	7076
0.179 (0.036)	-0.189 (0.036)	0.080 (0.013)		**					.214	7041
0.178 (0.036)	-0.194 (0.037)	0.079 (0.013)			-0.133 (0.041)				.174	7041
0.177 (0.037)	-0.195 (0.037)	0.077 (0.013)				-0.020 (0.011)			.171	7041
0.178 (0.037)	-0.196 (0.037)	0.077 (0.013)					-0.075 (0.072)		.170	7041
0.179 (0.036)	-0.197 (0.037)	0.078 (0.013)						0.087 (0.028)	.174	7041

Constant, education/training and family composition variables included but not reported.

* seg1 -0.259 (0.455); seg2 0.068 (0.024); seg3 0.178 (0.042); seg4 0.065 (0.026); seg5 0.236 (0.074); seg6 0.005 (0.031); seg7 -0.065 (0.026); seg8 -0.086 (0.046); seg9 -0.067 (0.020); seg10 -0.316 (0.067); seg11 0.021 (0.025); seg13 -0.129 (0.018); seg14 -0.216 (0.029); seg15 -0.001 (0.032); seg16 0.351 (0.070); seg17 0.380 (0.074); seg18 0.053 (0.049); seg19 -0.001 (0.079)

(SEG12=0 ; constant=-0.052(0.160)).

** ind1 0.266 (0.037); ind2 0.015 (0.038); ind3 0.061 (0.034); ind4 -0.009 (0.093); ind5 -0.060 (0.041); ind6 -0.063 (0.037); ind8 0.032 (0.079); ind9 0.192 (0.054); ind10 -0.107 (0.047); ind11 -0.067 (0.128); ind12 -0.016 (0.066); ind13 -0.004 (0.047); ind14 -0.014 (0.047); ind15 -0.017 (0.037); ind16 -0.003 (0.043); ind17 -0.047 (0.021); ind18 -0.028 (0.040); ind19 0.052 (0.022); ind20 0.020 (0.023); ind21 -0.055 (0.029); ind22 -0.018 (0.024); ind23 -0.069 (0.026); ind24 -0.038 (0.027)

(ind7=0 ; constant=-0.146(0.161)).

Table 3 (continued)

(b) Sample: Employed (at time of sample)
Dependent variable: Log (Hours worked in year as a proportion of maximum hours worked)

Independent Variables (logarithms of)		Dummies			Demand Variables (logarithms of)				R	No. in sample
Net Marginal Wage	Income Indicator	DWIF	SEG	IND	Wage	U/E	EMP	OUTPUT		
0.029 (0.019)	-0.066 (0.019)	-0.010 (0.007)							.234	6627
0.040 (0.018)	-0.073 (0.019)	-0.001 (0.007)	*						.332	6621
0.027 (0.019)	-0.059 (0.019)	-0.006 (0.007)		**					.293	6587
0.028 (0.019)	-0.061 (0.019)	-0.007 (0.007)			-0.212 (0.021)				.264	6587
0.025 (0.019)	-0.062 (0.019)	-0.009 (0.006)				-0.039 (0.006)			.248	6587
0.024 (0.019)	-0.062 (0.019)	-0.010 (0.007)					-0.249 (0.038)		.247	6587
0.029 (0.019)	-0.066 (0.019)	-0.010 (0.007)						-0.015 (0.014)	.234	6587

Constant, education/training and family composition variables included but not reported.

*

seg1	seg2	seg3	seg4	seg5	seg6	seg7	seg8	seg9	seg10	seg11
-0.304 (0.225)	0.055 (0.012)	0.152 (0.021)	0.030 (0.013)	0.175 (0.036)	-0.032 (0.015)	-0.097 (0.013)	-0.058 (0.023)	-0.080 (0.010)	-0.136 (0.036)	0.027 (0.012)

seg13	seg14	seg15	seg16	seg17	seg18	seg19
-0.023 (0.009)	-0.072 (0.016)	-0.011 (0.016)	0.220 (0.035)	0.232 (0.037)	0.011 (0.025)	-0.007 (0.041)

(SEG12=0 ; constant=-0.376(0.082)).

**

ind1	ind2	ind3	ind4	ind5	ind6	ind8	ind9	ind10	ind11	ind12
0.135 (0.019)	-0.024 (0.019)	0.031 (0.017)	-0.041 (0.047)	-0.010 (0.021)	-0.012 (0.019)	-0.023 (0.040)	0.016 (0.030)	-0.057 (0.025)	-0.054 (0.072)	-.025 (0034)

ind13	ind14	ind15	ind16	ind17	ind18	ind19	ind20	ind21	ind22	ind23	ind24
0.059 (0.025)	0.010 (0.024)	-0.011 (0.019)	-0.016 (0.022)	0.001 (0.011)	-0.066 (0.020)	0.047 (0.011)	-0.005 (0.012)	-0.090 (0.015)	-0.056 (0.012)	-0.054 (0.013)	-0.049 (0.014)

(ind=0 ; constant=-0.441(0.083)).

Table 3 (continued)

(c) Sample: Unemployed (at time of sample)
Dependent variable: Log (Hours worked in year as a proportion of maximum hours worked)

Independent Variables (logarithms of)		Dummies			Demand Variables (logarithms of)					
Net Marginal Wage	Income Indicator	DWIF	SEG	IND	Wage	U/E	EMP	OUTPUT	R	No. in sample
0.872 (0.389)	-0.711 (0.383)	0.542 (0.154)							.274	492
0.672 (0.422)	-0.614 (0.408)	0.509 (0.160)	*						.329	455
0.947 (0.414)	-0.787 (0.407)	0.584 (0.161)		**					.332	454
0.823 (0.399)	-0.654 (0.393)	0.534 (0.157)			-0.177 (0.560)				.267	454
0.833 (0.398)	-0.665 (0.392)	0.535 (0.157)				-0.011 (0.106)			.266	454
0.837 (0.398)	-0.670 (0.392)	0.534 (0.157)					-0.428 (0.615)		.268	454
0.844 (0.398)	-0.674 (0.391)	0.526 (0.157)						-0.442 (0.339)	.273	454

Constant, education/training and family composition variable included but not reported.

* seg1 | seg2 0.018 (0.385) | seg3 -0.550 (0.574) | seg4 0.363 (0.394) | seg5 | seg6 0.139 (0.715) | seg7 0.456 (0.428) | seg8 -0.071 (0.593) | seg9 -0.106 (0.211) | seg10 -0.681 (0.437) | seg11 -0.401 (0.305)

seg13 -0.399 (0.145) | seg14 -0.283 (0.200) | seg15 -0.311 (0.319) | seg16 | seg17 | seg18 -0.510 (0.666) | seg19 0.466 (0.657)

SEG12=0 ; constant=0.299(1.753)).

** ind1 0.525 (0.809) | ind2 -1.176 (0.665) | ind3 0.270 (0.339) | ind4 1.635 (1.153) | ind5 -0.486 (0.386) | ind6 0.174 (0.271) | ind7 0.076 (0.178) | ind8 1.421 (1.147) | ind9 -0.369 (0.325) | ind10 0.008 (0.324) | ind11 0.832 (0.670) | ind12 0.314 (0.584)

ind13 -0.143 (0.364) | ind14 0.116 (0.360) | ind15 0.331 (0.325) | ind16 -0.003 (0.416) | ind18 -0.120 (0.814) | ind19 -0.245 (0.224) | ind20 0.044 (0.215) | ind21 -0.269 (0.489) | ind22 0.414 (0.402) | ind23 -0.029 (0.209) | ind24 -0.155 (0.317)

(ind17=0 ; constant=0..248(1.730)).

Table 3 (continued)

(d) Sample: Top 30%
Dependent variable: Log (Hours worked in year as a proportion of maximum hours worked)

Independent Variables (logarithms of)		Dummies			Demand Variables (logarithms of)					
Net Marginal Wage	Income Indicator	DWIF	SEG	IND	Wage	U/E	EMP	OUTPUT	R	No. in sample
0.513 (0.053)	-0.463 (0.052)	0.001 (0.013)							.238	2135
0.529 (0.052)	-0.517 (0.051)	0.008 (0.013)	*						.330	2135
0.516 (0.053)	-0.445 (0.052)	0.002 (0.013)		**					.265	2123
0.514 (0.053)	-0.444 (0.052)	0.005 (0.016)			-0.191 (0.041)				.257	2123
0.508 (0.053)	-0.453 (0.052)	0.002 (0.013)				-0.028 (0.012)			.244	2123
0.506 (0.053)	-0.444 (0.052)	0.001 (0.013)					-0.274 (0.083)		.248	2123
0.512 (0.053)	-0.463 (0.052)	0.001 (0.013)						-0.010 (0.026)	.238	2123

Constant, education/training and family composition variables included but not reported

*

seg1	seg2	seg3	seg4	seg5	seg6	seg7	seg8	seg9	seg10	seg11
	0.034 (0.021)	0.223 (0.045)	0.018 (0.026)	0.165 (0.054)	-0.036 (0.026)	-0.129 (0.023)	-0.084 (0.036)	-0.044 (0.026)	0.021 (0.194)	-0.004 (0.026)

seg13	seg14	seg15	seg16	seg17	seg18	seg19
0.023 (0.031)	-0.039 (0.080)	-0.110 (0.044)	0.106 (0.112)	0.431 (0.194)		-0.022 (0.063)

(SEG12=0 ; constant=1.150(0.267)).

**

ind1	ind2	ind3	ind4	ind5	ind6	ind7	ind8	ind9	ind10	ind11	ind12
0.250 (0.090)	0.062 (0.035)	0.064 (0.042)	0.027 (0.074)	0.010 (0.038)	0.047 (0.045)	0.067 (0.023)	0.200 (0.079)	0.153 (0.077)	0.070 (0.065)		0.138 (0.082)

ind13	ind14	ind15	ind16	ind17	ind18	ind19	ind20	ind21	ind23	ind24
0.076 (0.057)	0.015 (0.065)	0.037 (0.037)	0.054 (0.055)	0.055 (0.026)	-0.004 (0.037)	0.084 (0.028)	0.089 (0.031)	-0.006 (0.027)	0.015 (0.035)	0.002 (0.028)

(ind22=0 ; constant=0.553(0.271)).

GLOSSARY

SEG variables

SEG1 Employers-25+ SEG2 Managers-25+ SEG3 Employers-under 25 SEG4 Managers-under 25 SEG5 Self-employed prof. worker SEG6 Employee prof. worker SEG7 Ancillary, Artists SEG8 Foremen, Super. non-m. SEG9 Junior non-manual SEG10 Personal service wrk. SEG11 Foremen, super.manual SEG12 Skilled manual SEG13 Semi-skilled manual SEG14 Unskilled manual SEG15 Non-prof, own-account SEG16 Farmers, empl, manager SEG17 Farmers, own-account SEG18 Agricultural workers SEG19 Armed Forces

IND variables

IND1 Agr. Forest.& Fish IND2 Mining & Quarrying IND3 Food, Drink & Tob. IND4 Coal, Petrol,Products IND5 Chemical&Allied IND6 Metal man. IND7 M.&El.Eng, V's, M.Gds IND8 Instr. Eng. IND9 Shipb, Marine IND10 Textiles IND11 Leather, Goods, Fur IND12 Clothing, Footwear IND13 Bricks,Pott.,Glass IND14 Timber, Furn. IND15 Paper, Publ., Print. IND16 Other Man. IND17 Construction IND18 Gas, Electric, Water IND19 Transport, Comm. IND20 Wholesale, Retail IND21 Ins., Bank., Fin Services IND22 Prof., Sci Services IND23 Misc. Services IND24 Public Admin.

Wage, U/E, Emp, Output

These are (log of) indices of the changes in the respective demand variable (wages, unemployment, employment, output) between 1975 and 1980 for the industry group of each individual relative to the aggregate UK changes. Sources: New Earnings Surveys 1975 & 1980, Employment Gazette various editions; CSO.

limited data on his wage offers, as proxied by our demand variables). Whether he does this over a year or a few months is immaterial, provided he exhausts his tax allowances. The point is that he can blend extra jobs, overtime, holidays and spells of benefit to create an optimal budget constraint.

Secondly, it allows benefits to be integrated as a component of the continuous portion of the budget constraint, and not as hitherto in the literature as a kink at the point of no work. This implies that low-paid people face a choice of spells on supplementary (unemployment) benefit even if they work; this is tremendously important in our view in understanding the work patterns of the low-paid, who we find are much more prone to unemployment spells. They are in a benefit trap which affects their average hours of work even if they are typically employed. Again, it is not the year unit as such that is of importance; rather, it is getting away from a weekly focus to recognise the possibilities of patterning work and leisure over weeks or months.

Thus, our formal assumption seems strong but it is operationally merely moving the focus away from the single week which is for obvious reasons implausibly short. Provided tax allowances are assumed used up, nothing would change in our analysis if we used a one-, three- or six-month focus instead of one year. Nevertheless, the need to use up tax allowances if possible makes the year a natural planning unit for the household.

Statistically, of course, we have controlled through IV for any biases introduced by our omissions. This strengthens our belief that better information would improve our basic explanation of hours without damaging our estimates of the key substitution elasticities.

Policy implications

These estimates are lower than those of Ashworth and Ulph (1981) for the average man but rather higher than those of Brown et al (1987). A net marginal wage elasticity of 0.2 lies quite comfortably therefore inside the range of plausibility. Where we break some new ground is for the unemployed and higher rate taxpayers, neither of which groups has been successfully analysed from the viewpoint of this paper in previous studies. We find that both exhibit higher elasticities; these appear to us to be plausible considering the high marginal tax rates faced by such people. That someone should be twice or three times as sensitive to a given change in incentives when his incentives are very poor seems a sensible conclusion.

From a policy viewpoint, this is important. Cutting top rates to a single 40% rate as in the 1988 Budget has quite dramatic impacts on top rate payers. Since these people are the most productive in our economy, the value of extra product is substantial. Table 4 suggests that the top 5% work 10% harder; since their marginal product is 2 1/4 times that of the average man (because of their 11% share in taxable income), then GDP is increased by over 1%.

Table 4: Incentive Effects - Top Taxpayers

New marginal tax rate (%)	Previous marginal tax rate (%)	Substitution effect (%)	Income effect (%)	Total effect (%)	Weight[a]
40	60	26	-7	19	0.26
	55	17	-3	14	0.12
	50	10	-2	8	0.24
	45	5	-1	4	0.38
Weighted average		13	-3	10	1.00

Weight of top taxpayer in employed population = 0.11.

[a] Weight = share in taxable income. Calculations assumes elasticities estimated by OLSQ for top 30% of tax payers (viz. +0.513 on marginal wage, -0.463 on income).

Turning to the unemployed, the main point here is the impact of incentives on the probability of being unemployed as opposed to working continuously. Raising incentives can lower this probability markedly as shown in Table 1. The 1988 Budget did little in itself to change these incentives; true, the Social Security Reforms planned under Mr.Fowler became operative from April 1988 and lowered marginal tax rates on many of those in the poverty trap. Nevertheless, because these changes did little in themselves to the relationship between unemployment benefits and work income, the results here suggest the effect of these on work effort was on average small over the whole sample. Far more important has been the tightening up of the worktest procedures, as in the 'Restart' programme; in principle, a proper worktest would abolish the benefit-affected segment above for someone facing available work, since he would be unable to claim unemployment benefits.

This study suggests that the tax revenue surge from top rate payers could well indeed have come from what prima facie it seemed to come from- a massive increase in work effort by people held back by very high marginal rates, giving further support to the relevance of the Laffer Curve. What is true at the top may, it also suggests, be as true for the bottom, tending to confirm our earlier time-series work on unemployment.

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