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Felix FitzRoy, Jim Jin

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Corresponding author:
Felix FitzRoy
University of St Andrews | School of Economics and Finance
frf@st-andrews.ac.uk

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Hamburg Institute of International Economics (HWWI)
Heimhuder Str. 71 | 20148 Hamburg | Germany
Phone: +49 (0)40 34 05 76 - 0 | Fax: +49 (0)40 34 05 76 - 776
info@hwwi.org | www.hwwi.org
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# Efficient Redistribution:
# Comparing Basic Income with Unemployment Benefit

Felix FitzRoy*
Jim Jin**
University of St. Andrews

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Abstract

Given a general utility function and income distribution, we compare two systems of income redistribution: unemployment benefits (UB) conditional on not working and basic income (BI) available to everyone. Based on strong empirical evidence we first focus on extensive margins of labor supply. For any given unemployment level, lowering UB and raising BI always benefits the unemployed, raises utilitarian welfare and benefits a poor majority. Reducing unemployment and UB simultaneously can benefit a majority of the employed as well as all unemployed. Similar results hold even if we allow involuntary unemployment or intensive margins.

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* Corresponding author: School of Economics and Finance, University of St Andrews, St Andrews KY16 9AL, Scotland, UK, Tel. (01334)-462437, e-mail: frf@st-andrews.ac.uk.

** School of Economics and Finance, University of St Andrews, St Andrews KY16 9AL, Scotland, UK, Tel. (01334)-462447, e-mail: jyj@st-andrews.ac.uk

## 1. Introduction`

All developed economies use tax systems to redistribute income and alleviate poverty. These welfare systems are generally targeted at the most needy, and withdrawn or phased out quite rapidly for those in full-time work, or when earnings exceed some threshold. This means that less-qualified workers, particularly under generous European social security systems, may earn little more than they would receive as benefit income. The very high implicit marginal tax rate faced by unskilled workers entering employment forms the ‘poverty trap’, which is widely seen as a substantial barrier to leaving dependency. On the other hand, if transfers to the unemployed are minimal, as in the UK and US, a rapid rise of unemployment and under-employment in recession and its aftermath (one in six of the US labor force in 2010) will ensure a much larger deprived share of the population than in Western Europe, with all its attendant social ills (Wilkinson and Pickett 2009).

A fundamental alternative to all kinds of conditional income support for the poor is a system of universal benefits, or an unconditional basic income for all citizens. This idea has attracted increasing academic and political attention (Atkinson 1995 and 2002; Offe 2008). Unusually, it has received support across a broad political spectrum, from conservatives to liberals and greens (Clark and Kavanagh 1996). Beside its economic benefits of alleviating the unemployment problem, basic income has broad implications for society, such as offering social security and freedom to all, enhancing equality and job satisfaction etc (for comprehensive discussion see Fitzpatrick 1999)[1]. In this paper we

[1] A specialized journal “*Basic Income Studies*” is devoted to this topic.

use a simple model of redistribution and unemployment to show that basic income has rather surprising advantages over unemployment benefit.

While removing the ‘poverty trap’, a basic income would of course have to be paid to the employed majority as well as to the unemployed, and in spite of many attractive properties has traditionally been considered to be too costly compared to the gains from additional unskilled employment. To maintain the welfare of the unemployed with a basic income at a similar level as conditional benefits would seem to require considerably higher taxes, which are likely to raise unemployment, and reduce most workers’ welfare. Thus, while categorical unemployment benefits (UB) have existed for a long time in most western countries, a universal basic income (BI) or lump sum transfer still remains an untested and controversial, though increasingly popular, idea.

Optimal tax models often find that a universal transfer should be rapidly phased out by high marginal rates on low earners, followed by low marginal rates on middle and high incomes (Kaplow 2008). Such a largely regressive tax system mimics the effect of a categorical transfer to the unemployed which is withdrawn on entering employment, and imposes a high implicit marginal tax rate on low earners, who may not gain from working, and are caught in a ‘poverty trap’. Furthermore, high initial marginal rates raise infra-marginal revenue from high earners, in contrast to politically more acceptable progressive systems. Optimal tax studies usually focus on individual labour supply, with an identical elasticity for all wage or skill levels, while neglecting the very low supply elasticity found empirically for full-time workers, and the most important extensive margin of participation. In their survey of tax theory and policy, Mankiw et al (2009, p.2) suggest that, “A flat tax, with a universal lump-sum transfer, could be close to optimal”.

There has been little direct comparison of UB and BI in simple models with endogenous unemployment. Atkinson (1995) found that an exogenous group of disabled or sick, who were unable to supply any labour, could benefit from a categorical transfer, in addition to the basic income, but this approach does not include the extensive margin. Colombino et al (2010) recently carried out a systematic and detailed comparison of welfare and tax reform using disaggregated, microeconometric models and numerical simulations. Instead of focusing on the intensive margin and assuming a constant elasticity of labour supply, they include both intensive and extensive margins of the labour supply, and incorporate empirical evidence that the elasticity of labour supply is close to zero for full time workers[2]. In this more realistic framework, they find that universal systems close to BI, in combination with progressive taxes, may in fact dominate other welfare and tax reforms for some countries. Related work by Immervoll et al (2007), building on the optimal tax results of Saez (2002), finds that in-work benefits, which have become popular in recent years, tend to dominate, though such policies do not provide direct assistance to the unemployed.

The empirical evidence indeed shows that full-time labour supply is unresponsive to wages and taxes. Hours of work for full-time employees are generally determined by job-requirements, not individual preferences. The highest earners work long hours as an integral part of job requirements, and have little scope for responses to tax/wages. On the other hand, the participation decision for low-wage and part-time workers, many of them female, appears to be highly sensitive to financial incentives and alternatives to the labour market from available welfare benefits or at home (Colombino et al 2010; Immervoll et al

[2] A separate issue is the ability of the rich to avoid tax by substituting into traditionally low-tax forms of income such as stock options (or emigrating), yielding relatively high tax revenue elasticity (Kaplow 2008).

2007). For example, Eissa and Liebman (1996) examined the impact of the U.S. Tax Reform Act 1986, which extends tax credit to single mothers, and found significant effects on labor participation, but no effect on the working hours of single mothers who were already in the labor force.

Chone and Laroque (2005 and 2008) have developed a model of the labour market with a distribution of ability, but only an extensive margin, assuming hours and earnings per unit of calendar time (week, month, or year) are given as part of the job 'package', and depend on ability or productivity. The only choice is thus whether to work, at a wage equal to individual productivity, or to rely on transfers. In the light of the empirical evidence summarized above, this approach represents a useful approximation and simplification for our purposes.

In this paper we use a similar model to compare welfare effects of categorical unemployment benefits (UB) and universal basic income (BI), with endogenous (voluntary) unemployment. We restrict our attention initially to the extensive margin or participation decision, in the spirit of Chone and Laroque (2005 and 2008). We further simplify by assuming that only those with the lowest abilities prefer not to work, so for given tax and benefits there is always a *marginal worker*, such that those with lower ability or potential earnings choose not to work, and those with higher earnings prefer work. This is supported by the very low participation elasticity found for high earners (Blundell 1995), and accords with the strong positive correlation between earnings and non-pecuniary benefits such as job security and satisfaction found in surveys (Helliwell and Huang 2005).

In contrast to the conventional wisdom, we find that BI generally dominates UB in most plausible circumstances. In particular, given any equilibrium unemployment level, lowering UB requires a higher tax rate and BI. It seems plausible that the net impact on the unemployed should depend on income distribution, the utility function and the level of unemployment. Surprisingly, however, this change always benefits the unemployed irrespective of all these factors. It reduces high net incomes, but always benefits lower-wage earners and even *a majority of the population*, provided the mean of population earnings is greater than the median, as is usually the case. Furthermore, lowering UB (with given unemployment, but higher tax and BI) is utilitarian welfare improving. Thus shifting transfers from UB to BI generally improves the efficiency of redistribution, and can be supported by a poor majority, though opposed by a minority of the richest. Moreover, we can show that simultaneously reducing both unemployment and UB can benefit a majority of the *employed* population, as well as the unemployed, whatever the initial level of unemployment, thus offering potential political support even when the unemployed have only weak 'voice' in the process.

The main results are still valid when there is also involuntary unemployment. The key conclusion is also reasonably robust in the standard model, which allows both intensive and extensive margins. Using a simple, quasi-linear utility function with constant elasticity of labour supply, we show that the unemployed are usually better off under BI than UB regardless of the elasticity. This indicates that the intensive margin of labour supply does not dominate the extensive margin for UB and BI comparison, at least in our simple framework. The broader benefits of BI mentioned above, and issues of growth and dynamic employment are not addressed here.

The plan of the paper is to describe the model in Section 2. In Section 3 we obtain main results by evaluating a mixed system of UB and BI. Sections 4 and 5 compare pure UB and BI systems with involuntary unemployment and intensive margins respectively. We summarize our conclusions in section 6. All proofs are in the Appendix.

**2. The Model**

We assume a frictionless labour market with voluntary unemployment and the total population is normalized to one. The government imposes a flat tax rate $t$ to finance UB for the unemployed and BI for everyone. If a person works, his income consists of after-tax earnings plus BI; if he does not work his income is just BI plus UB. We first assume fixed working times for households, leaving them only the extensive margin or the participation decision. There is no intensive margin because jobs offer wage income and work requirements as a fixed package. Earnings are defined per calendar time period, reflecting workers' productivity, denoted by $y$ and distributed on $[a, b]$, with $0 \leq a < b$, according to a distribution function $F(y)$ and a corresponding density function $f(y)$.

As part of the contract, there is a required costly effort $e$ associated with employment, which includes the opportunity cost of time at work, such as 40 hours per week, while allowing for the non-pecuniary benefits. In many cases contracts for highly paid jobs require more hours and effort. On the other hand they also tend to offer better non-pecuniary benefits and job satisfaction. It is not always clear how the net disutility of work changes with income. Our simple assumption of a constant effort can be relaxed without substantial impact on our conclusions.

There is a flat tax, $t$, on earnings, to fund unemployment benefit $u$ conditional on not working, and basic income $B$, which is a transfer to all, independent of work status.

We allow any mixture of BI and UB systems. A household's income is thus $y(1-t)$ plus $B$ if working, and $B + u$ if not working.

We assume that everyone has a utility function $V(m, e)$, where $m$ is income[3]. It is continuously increasing, differentiable and concave in $m$, and decreasing in $e$. If an individual works, his utility is $V[y(1 - t) + B, e]$. If he does not work, he receives $u$ and $B$, but gains leisure, so his utility is $V(u + B, 0)$. The assumption implies that given any tax rate $t$, there exits a marginal worker type with earnings $x$, such that all workers with higher earnings prefer employment, while $F(x)$, or those with lower earnings, choose not to work. The condition for this marginal worker $x$ to be indifferent between work and unemployment, can be expressed as:

$$V[x(1 - t) + B, e] = V(u + B, 0) \tag{1}$$

We assume that the marginal worker's marginal utility of income is lower when she chooses to work than not work. This is reasonable, because she has more income when working and the marginal utility of income falls. Also, her marginal utility should be higher when not working since more time should allow more efficient consumption.

Given $x$, aggregate earnings or the economy's total output is $\int_x^b yf(y)dy$, denoted by $Y(x)$. The government budget constraint is then:

$$tY(x) = B + uF(x) \tag{2}$$

When $x$ is fixed, we can choose the value of any one of three variables $t$, $B$ and $u$, and the other two will be determined by (1) and (2). In the following we will focus on

[3] We can allow different utility functions for different productivity types, and still obtain our main results. But for a simple presentation, we restrict attention to the case of identical utility functions.

how changes in $u$ affect the utility of the unemployed and social welfare, so $t$ and $B$ become functions of $u$, which is then the government's only policy variable[4].

For simplicity we consider a flat tax only, but this assumption is not crucial. In the case of progressive taxes, we can separate the tax structure into two parts, one is the single tax rate $t$ applying to all, and the other includes additional marginal rates for high earners. The latter has no effect on the marginal worker since he only faces $t$, so (1) remains valid. The only change in (2) will be an extra term on the left hand side, representing extra tax revenue from higher tax rates. If we change $t$ but keep other tax rates constant, the extra term does not change and the impact on (2) is the same as before. Hence this modification will not change our main results obtained below.

## 3. Main Results

In this section we show that reducing UB can benefit the unemployed and raise the social welfare. We allow any mixture of BI and UB systems, and show that an increase in the former at the expense of the latter always benefits the poor, particularly the unemployed, and raises utilitarian welfare. Moreover, such a change is beneficial to a poor majority, and consequently politically feasible. Finally, if earnings are finite, it may be a Pareto improvement as well.

We assume that the economy currently has a mixed system with $u_1 > 0$, marginal worker's earnings $x_1$ and unemployment rate $F(x_1) > 0$. The change we consider is to lower $u$. Meanwhile we will adjust tax rate $t$ and basic income $B$ such that $x_1$, hence the

[4] The value of $u$ is not indexed to wages or earnings. Otherwise the tax rate would have little impact on the unemployment, as shown by Pissarides (1998).

unemployment rate $F(x_1)$, remain the same. Lowering UB and maintaining constant unemployment requires a higher tax rate and BI.

Given any $x_1$, changes in $t$ and $B$ associated with reducing $u$ can be solved from (1) and (2). We can show that, as $u$ falls, $B$ will rise by a larger amount (see Appendix A). Hence $B + u$ must increase as $u$ falls, and we have a seemingly counter-intuitive result:

***Proposition 1***: *For any given* $x_1$*, lowering UB, and hence raising tax and BI, always benefits the unemployed*.

This means that, without raising unemployment, the extra revenue from the higher tax is always more than sufficient to compensate for the extra cost of providing BI to the whole population. If our goal is to maximize the wellbeing of the unemployed, we can always do better by raising BI at the expense of UB, until we reach a pure BI system. It is surprising that this conclusion does not depend on the type of utility function, income distribution or initial level of unemployment.

Since both $u_1$ and its change can be very small, our model does not require a discrete or significant jump or drop in UB. Indeed our conclusion holds for any magnitude of UB reduction from any initial level. The only major assumption is the absence of intensive margins. As we will show later, the basic conclusion is likely to hold even if we allow for intensive margins, regardless of how strong they are.

In reality the Rawlsian objective may not entirely capture the purpose of the income redistribution. The government must take into account the potential negative impacts on others, rather than just benefits for the worst-off. So our next question is to investigate how UB reduction affects the employed and society as a whole. We can consider again a reduction of UB without changing unemployment. If this change benefits those with low earnings and raises aggregate or utilitarian welfare, the adoption of BI will have more social justification.

This is indeed the case. Let $B_2$ and $t_2$ be the BI and tax rate after the UB reduction. Our earlier result implies $B_2 > B_1$ and $t_2 > t_1$. Given any $x_1$, lowering $u$ benefits an employee with earnings $y$ if and only if $y(1 - t_2) + B_2 > y(1 - t_1) + B_1$, or equivalently $y < (B_2 - B_1)/(t_2 - t_1)$. Since $x_1$ is fixed, the change in $u$ does not affect the total output, and merely redistributes it from the rich to the poor. After the redistribution, those with higher productivities still have higher income and enjoy higher utilities. Given our assumption, the unemployed and the low-income earners have higher marginal utility of income. Hence such income redistribution must raise the total welfare.

***Proposition 2***: *Given any $x_1$, UB reduction always benefits low-income earners and raises utilitarian welfare*.

Since unemployment and total output do not change, raising BI at expense of UB can be viewed as redistributing income from the rich to the poor *without* losing productive efficiency, and increasing utilitarian welfare. This seems socially desirable, except for likely opposition from the rich. Hence we need to investigate more precisely who benefits from lower UB and higher BI, and who do not. In particular we need to know their relative shares in the population.

***Proposition 3***: *For any given $x_1$, UB reduction benefits those with earnings less than $Y(x_1) + x_1F(x_1)$, but hurts those with earnings greater than $Y(x_1)/[1 - F(x_1)]$.*

Proof: see Appendix B.

We notice that $Y(x_1)/[1 - F(x_1)]$ is average earnings of the employed, and the expression $Y(x_1) + x_1F(x_1)$ is a kind of 'weighted' average earnings of the whole population, with all the weight for the unemployed given to the marginal worker $x_1$. So a person is worse off if he earns more than an average employee, while he is better off if he earns less than the weighted population average. If the initial unemployment is very low, i.e. $F(x_1)$ is close to zero, these two averages are close to each other, and the precise demarcation between the worse-off and better off is restricted to a small interval.

Our result suggests that lowering UB is likely to be supported by a majority of the population. We know $x_1F(x_1) + Y(x_1)$ is higher than the average population earnings $Y(a)$. Empirical data show that the average earnings are always higher than the median. Hence the majority of the population is better off with a UB reduction.

However, we are not sure if the majority of the working population supports a UB reduction. This ambiguity is due to the fact that we maintain the same unemployment, i.e. a fixed $x_1$. If we are not committed to the same unemployment, we need not raise the tax so much as in the previous case, while lowering UB. This will reduce the income transfer to the unemployed, but increases employment, and imposes less damage to the rich. As long as we keep the unemployed indifferent, we can make most people better off, and maximize political support for the UB reduction. In particular, we will be able to lower unemployment and benefit a majority of the employed.

***Proposition 4***: *Reducing both UB and unemployment can benefit everyone with earnings less than* $Y(x_1)/[1 - F(x_1)]$.

Proof: see Appendix C.

Since median earnings are lower than the mean, such a UB reduction will benefit the majority of the employed. This ensures political support even if the decision process excludes or gives low weight to the unemployed.

Finally, a natural question arises: how far can political support go? In other words, can a UB reduction be a Pareto improvement? If yes, we have the strongest argument to recommend such a tax reform. Not surprisingly, the general answer is negative. If there are individuals with extremely high earnings a tiny increase in tax will reduce their income so much that they cannot be fully compensated by an (relatively small) increase in BI. These individuals are definitely worse off.

Nevertheless, when earnings are bounded, the above argument may not apply. It is possible that a UB reduction benefits everyone. To demonstrate such a possibility, we compare two extreme cases: a pure UB system with $u_1 > 0$ and $B_1 = 0$ vs. a pure BI system with $u_2 = 0$ and $B_2 > 0$. Rather than keeping a fixed $x_1$, we allow unemployment to fall as in the case of Proposition 4, so we can minimize the tax increase, and reduce the burden on the rich. Meanwhile, to keep the unemployed indifferent for a UB reduction, $B_2$ should be equal to $u_1$. The change from a pure UB system to a pure BI will be a Pareto improvement if the richest person is not worse off.

Since the richest worker has a utility $V[b(1 - t) + B, e]$, he is better off if and only if $B_2 > b(t_2 - t_1)$. The budget constraint (2) with pure UB is $t_1 Y(x_1) = u_1 F(x_1)$, with pure BI it is $t_2 Y(x_2) = B_2$. As $B_2 = u_1$, the previous inequality becomes

$$b\left\{\frac{1}{Y(x_2)} - \frac{F(x_1)}{Y(x_1)}\right\} < 1 \qquad (3)$$

(3) is the necessary and sufficient condition for a Pareto improvement. To show its potential validity, we consider a special case where $e$ = 0. In the real world most people prefer leisure to work, but also suffer psychologically from being unemployed. Our assumption holds if these two effects cancel each other out. Since there is no cost to work, no voluntary unemployment exists with pure BI, i.e., $x_2 = a$. We assume the simplest uniform distribution $f(y) = 1$, $a = 0$ and $b = 1$. Then we have $Y(a) = 0.5$, $F(x_1) = x_1$ and $Y(x_1) = 0.5(1 - x_1^2)$. One can check that (3) holds if and only if $x_1 > \sqrt{2} - 1$. Thus, switching from pure UB to pure BI is a Pareto improvement if and only if the initial unemployment rate is more than 41%. This is not a realistic case, but indicates the possibility of a Pareto improvement when UB causes very high unemployment.

**4. Involuntary Unemployment**

In the previous section, we made an unrealistic assumption that there is only voluntary unemployment. In this section we will show that, our main conclusions remain valid, when there exists involuntary unemployment, either predictable or not, so long as it is not affected by the choice of UB and BI. Given limited space we will focus on the result of Proposition 1, i.e. for any fixed voluntary unemployment, reducing UB will benefit the unemployed, both voluntarily and involuntary. First we show that this holds when aggregate involuntary unemployment is predictable.

We assume that a worker with productivity $y$ has a probability $p(y)$ to find a job. So the involuntary unemployment is represented by $\Delta F \equiv \int_x^b [1 - p(y)] f(y) dy$, and the loss of the total output is $\Delta Y \equiv \int_x^b [1 - p(y)] y f(y) dy$. We assume that job search incurs a cost of $s(y)$ for worker $y$. So he is indifferent between looking for a job or not when

$p(y)V[y(1-t)+B, e]+[1-p(y)]V(u+B, 0)-s(y)=V(u+B, 0)$. Simplifying gives the condition for the marginal voluntarily unemployed worker $x$, similar to the previous (1):

$$V[x(1-t)+B, e]-s(x)/p(x)=V(u+B, 0) \tag{1'}$$

We assume that $s(x)/p(x)$ does not rise with $x$. This plausible since more productive workers have more chances to find jobs for each unit of searching cost. Then the left hand side of (1') is monotonically increasing in $x$, and given $u$ and $B$ there is always a unique solution for the voluntarily unemployed level $x$. The corresponding budget constraint (2) is modified due to $\Delta F$ and $\Delta Y$, and becomes:

$$t[Y(x)-\Delta Y]=B+u[F(x)+\Delta F] \tag{2'}$$

When $\Delta F$ and $\Delta Y$ are predictable, the government can take their impacts into account and adjust $B$ and $u$, to maintain a certain level of the voluntary unemployment level $F(x_1)$ as before. To obtain this fixed $x_1$, we can still choose $u$ as the decision variable, and the tax rate $t$ and basic income $B$ will be determined by (1') and (2').

We can find the same result as Proposition 1 following the same proof as in Appendix A. We see that $dB/du<-1$ if and only if $x_1[F(x)+\Delta F]>x_1-Y(x)+\Delta Y$. This inequality holds if and only if $Y(x)-\Delta Y>x_1[1-F(x)-\Delta F]$, which is guaranteed as the total earnings must be larger than the number of the employed multiplied by the marginal worker's earnings. Hence we can extend our earlier conclusion, for a given unemployment level, reducing UB always makes the unemployed better off when total involuntary unemployment is predictable.

***Proposition 5***: *If the aggregate level of involuntary unemployment and income loss are predictable, for any given* $x_1$, *lowering UB always benefits the unemployed*.

In the real world, of course, involuntary unemployment is not predictable. We denote the involuntary unemployment and the corresponding income loss by $\Delta F + \phi$ and $\Delta Y + \eta$, where $\phi$ and $\eta$ are unexpected shocks, with $E(\phi) = E(\eta) = 0$. If the government does not face a binding budget constraint, it can still adjust its targeted levels of BI and UB according to estimated $\Delta F$ and $\Delta Y$, and the voluntary unemployment is still determined by (1'). The announced $u$ and $B$ will be paid through borrowing if necessary. Unexpected shocks will be balanced out in the long run. There will not be any substantial changes compared with the predictable involuntary unemployment.

If the government faces a binding budget constraint such as in serious economic downturns ($\phi > 0$ and $\eta > 0$) the actual BI and UB may be lower than the targeted levels set by the government. We assume the voluntary unemployment is still determined by the expected $u$ and $B$, while the actual payment is determined by the realized budget constraint. These random shocks may affect the unemployed differently under pure UB and BI systems. When the involuntary unemployment is unexpectedly high, the loss of tax revenue will be larger under a pure BI system, because the tax rate is higher than in the case of a pure UB system. On the other hand, although the tax revenue falls less under a pure UB system, it is concentrated on a smaller proportion of the unemployed. The income loss for the unemployed may be higher than in the case of a pure BI system. It is not obvious that a pure BI system is still preferred by the unemployed as before.

For simplicity we limit our comparison to pure BI and UB systems, with basic income $u_1$ and unemployment benefit $B_2$ respectively. Although the involuntary unemployment is uncertain, the voluntary unemployment level $F(x)$ is determined by the announced $u_1$ and $B_2$. We can show that a pure BI system is still likely to dominate a pure UB system for all unemployed, either voluntarily or not.

When unexpected shocks are zero, the value of pure UB is determined by (2') as $u_1 = t_1[Y(x) - \Delta Y]/[F(x) + \Delta F]$, and the value of pure BI is $B_2 = t_2[Y(x) - \Delta Y]$. They imply $B_2/u_1 = [F(x) + \Delta F]t_2/t_1$. With random shocks unemployment is $F(x) + \Delta F + \phi$, and output is $Y(x) - \Delta Y - \eta$. The budget constraint becomes

$$t[Y(x) - \Delta Y - \eta] = B + u[F(x) + \Delta F + \phi] \qquad (2'')$$

Hence the affordable pure UB becomes $u_1' = t_1[Y(x) - \Delta Y - \eta]/[F(x) + \Delta F + \phi]$, and pure BI is $B_2' = t_2[Y(x) - \Delta Y - \eta]$. The latter is larger than the former if and only if $t_2 > t_1/[F(x) + \Delta F + \phi]$. Substitute the previous equality $B_2/u_1 = [F(x) + \Delta F]t_2/t_1$ into this inequality, we obtain $B_2/u_1 > [F(x) + \Delta F] /[F(x) + \Delta F + \phi]$. Hence we get

***Proposition 6***: The unemployed are better off in a pure BI system than a pure UB system if and only if $\dfrac{\phi}{F + \Delta F} > \dfrac{u_1 - B_2}{B_2}$.

From Proposition 1, we know that $B_2 > u_1$. Thus the inequality is guaranteed if $\phi > 0$. If the involuntary unemployment is higher than the expected level, the unemployed are definitely better off under a pure BI system. It means that a pure BI system protects the unemployed better against the worst situations.

Moreover, since $B_2$ is significantly larger than $u_1$, the inequality can only be reversed when $\phi$ is significantly negative, which is unlikely. Therefore we can see that a pure BI is very likely superior to a pure UB for the unemployed. Even if the unemployed might be worse off when $\phi < 0$, their need for protection is less, since the income is higher than the expected level. In this case at least a pure BI system serves the unemployed as an insurance device.

## 5. Intensive Margins

In this section we show that our earlier results can hold even if we allow intensive margins. We assume a quasi-linear utility function to provide a simple example, but allow individually optimal labour supply, with both extensive and intensive margins. A worker's productivity or type $w$ defines the hourly wage, distributed according to a distribution function $G(w)$ and associated density function $g(w)$ on $[\alpha, \beta]$, with $0 \leq \alpha < \beta$. If $\alpha = 0$, these individuals have zero productivity, and are thus effectively disabled. We allow a possibly positive measure of such individuals.

Workers can choose working hours, $h$, and the disutility of work is equal to $h^{1+1/\varepsilon}/(1 + 1/\varepsilon)$, where $\varepsilon > 0$, is the elasticity of labour supply. A household's overall utility is its income minus the disutility of work. Given a flat tax $t$ and either a pure UB or BI system, total income consists of basic income $B$, plus after-tax earnings $wh(1 - t)$ or unemployment benefit, $u$. We use this model to compare pure systems of UB and BI in terms of the utility of the unemployed.

In our model, a worker's utility $V = wh(1 - t) + B - \dfrac{h^{1+1/\varepsilon}}{1+1/\varepsilon}$. His optimal hours maximizing $V$ are $[w(1 - t)]^{\varepsilon}$, and the resulting utility is $B + \dfrac{w^{1+\varepsilon}}{1+\varepsilon}(1 - t)^{1+\varepsilon}$. If he does not work, his utility is $u + B$. Hence he chooses to work if and only if $u < [w(1 - t)]^{\varepsilon+1}/(1 + \varepsilon)$. Clearly, when $u = 0$, everyone with $w > 0$ chooses to work, and there is no voluntary unemployment, except for those with $w = 0$, who are permanently unemployed. With unemployment benefit $u > 0$, there will be voluntary unemployment if $\alpha$ is sufficiently small and the wage of the marginal employee $s$ is determined by

$$u = \frac{s^{1+\varepsilon}}{1+\varepsilon}(1-t)^{1+\varepsilon} \tag{4}$$

The corresponding unemployment rate is $G(s)$. Then total earnings or output are $\int_s^\beta whg(w)dw = (1-t)^\varepsilon \int_s^\beta w^{1+\varepsilon} g(w)dw$. We denote $\int_s^\beta w^{1+\varepsilon} g(w)dw$ by $W(s)$. Thus the government budget constraint is:

$$t(1-t)^\varepsilon W(s) = B + uG(s) \tag{5}$$

We now compare the utility of the unemployed under the two extreme cases of pure UB or pure BI. We start with the UB case, where $u_1 > 0$, $B_1 = 0$, the marginal worker is denoted by $s_1$, and the unemployment rate is $G(s_1)$. The corresponding tax rate is $t_1$. We compare this situation with the BI case where $B_2 > 0$, $u_2 = 0$, all individuals with $w > 0$ choose to work, and those with $w = 0$ are always 'unemployed'. If $B_2 > u_1$, those with $w = 0$ must be better off after the change because they receive more income. The newly employed must be better off too since they are better off than those remaining unemployed. Thus all unemployed before the change are better off if $B_2 > u_1$.

We can show that $B_2 > u_1$ in plausible cases. In most economies the marginal workers earn low wages, compared with the average wage of the population. Given our definition, the average wage is equal to $\int_\alpha^\beta wg(w)dw$, denoted by $\bar{w}$. Thus we usually expect $s_1$ to be small relative to $\bar{w}$. If this is true, we can prove that $B_2 > u_1$.

***Proposition 7***: *All unemployed under pure UB will be better off under pure BI if* $s_1(1 - t_1) < 0.7\,\overline{w}$.

Proof: see Appendix D.

The inequality in Proposition 7 is likely to hold. If $t_1$ = 30%, it reduces to $s_1 < \overline{w}$, which is almost guaranteed as people with average productivity usually work. When $t_1$ is smaller, $s_1$ should also be lower, and the inequality is still likely to hold. For instance, when $t_1$ is close to 0, the tax revenue is almost zero and $u_1$ must be very low. Hence $s_1$ should be nearly zero, and the inequality should hold. In any case the inequality must hold if $s_1 < 0.7\,\overline{w}$, which merely requires that the marginal worker's wage to be lower than 70% of the average wage, again quite likely.

This result imposes no restriction on the elasticity of labor supply $\varepsilon$. It indicates that regardless of how strongly labor supply responds to tax, the unemployed are usually better off under the pure BI system, given any wage distribution. This is rather surprising. Moreover, the BI system in our model eliminates all voluntary 'unemployment', (though labour supply will be low for the least productive), and of course also the poverty trap. This contradicts the common and intuitive perception that to maintain or raise the welfare of the unemployed under BI, tax rates must increase so much that unemployment will also rise. Given limited impacts of intensive margins both according to our model, and empirically observed by previous researchers, our earlier results with only extensive margins seem plausible.

## 6. Conclusions

In this paper we argue for the superiority of basic income to unemployment benefits. Our model with only extensive margins seems to be a reasonable approximation according to the empirical evidence. Our findings indicate rather surprising, superior welfare and efficiency properties of BI, which not only removes the ‘poverty trap’ effect of UB, but also provides more income to a given number of unemployed, leads to higher utilitarian welfare and benefits a poor majority. Moreover, allowing unemployment to fall, reducing UB and moving towards BI can even benefit a majority of the employed, and potentially be a Pareto improvement. Our results are robust to allowing for involuntary unemployment and intensive margins.

To keep the model simple, we neglect administrative cost-savings, and the non-pecuniary advantages of BI, such as providing security and raising job quality for the less skilled, particularly when combined with a flat tax, which also implies significant savings in administrative costs and avoidance of incentive distortions, as widely discussed in the literature. Our results do not depend on the simplifying assumption of a flat tax, and a progressive tax may have advantages for redistribution, up to ‘political’ limits on top rates, which have to be balanced against additional administrative costs. The main conclusions are also robust to welfare dependence on relative income, in a broader framework of subjective wellbeing. These generalizations might further strengthen the case for basic income, and perhaps also for a flat tax.

Our simple static model does not consider important issues such as the duration of UB, a hotly debated topic in the current economic downturn, or the demand side of the labor market. Hopefully, our promising initial results will encourage further work using more sophisticated models, as a challenge for future research.

## References

Atkinson, A. B., *Public Economics in Action: The Basic Income/Flat Tax Proposal*, Clarendon Press, Oxford, 1995

Atkinson, A. B., 2002, "How Basic Income is Moving up the Policy Agenda: News from the Future", Paper presented at the 9th BIEN International Congress, 13 September 2002, Geneva (revised version).

Blundell, R. W., 1995, "The Impact of taxation on Labour Force Participation and Labour Supply", in *OECD Job Study:Taxation, Employment and Unemployment*, Chapter 3, Paris: OECD

Chone, P., and G. Laroque, 2005, "Optimal Incentives for Labour Force Participation", *Journal of Public Economics*, vol. 89(2-3), pp. 395–425.

Choné, P. and G. Laroque, 2008. "Optimal Taxation in the Extensive Model" IFS Working Papers, W08/08, Institute for Fiscal Studies.

Clark, C. and C. Kavanagh, 1996, "Basic Income, Inequality and Unemployment: Rethinking the Link between Work and Welfare", *Journal of Economic Issues*, vol. 30, pp. 399-406

Colombino, U., M. Locatelli, E. Narazani & O'Donoghue, C. (2010) "Alternative basic income mechanisms: An evaluation exercise with a microeconometric model". IZA DP No. 4781, Bonn.

Eissa, N. and J. Liebman, 1996, "Labor Supply Response to the Earned Income Tax Credit", *Quarterly Journal of Economics*, vol. 111, pp. 605-637.

Fitzpatrick, T., *Freedom and Security: an Introduction to the Basic Income Debate*, Palgrave Mcmillan, 1999,

Immervoll, H., H. Kleven, C. Kriener, & Saez, E., 2007, "Welfare reform in European countries: A microsimulation analysis", *Economic Journal*, 117, no. 516, pp. 1-44.

Helliwell, J. F. and H. Huang, 2005, "How's the Job? Well-being and Social Capital in the Workplace", NBER Working Paper No. W11759

Kaplow, L., 2008, *The Theory of Taxation and Public Economics*, Princeton University Press

Mankiw, N. G., M. Weinzierl & D. Yagan, 2009, "Optimal taxation in Theory and Practice", NBER Working Paper No. 15071

Offe, C., 2008, "Basic Income and the Labour Contract", *Basic Income Studies*, vol. 3, pp. 1-30.

Pissarides, C., 1998, "The Impact of Employment Tax Cuts on Unemployment and Wages, the Role of Unemployment Benefits and Tax Structure", *European Economic Review*, vol. 42, pp. 155-183

Saez, E. (2002) "Optimal income transfer programs: intensive versus extensive labour supply Responses", *Quarterly Journal of Economics*, 117 (3), pp. 1039-1073.

Wilkinson, R. and K. Pickett, *The Spirit Level*, Allen Lane, London, 2009.

***Appendix A: Proof of Proposition 1***:

Given $x_1$, we differentiate (1) and (2) with respect to $u$, and obtain:

$$\left\{\frac{dB}{du} - x_1\frac{dt}{du}\right\} V_1[x_1(1-t)+B,e] = \left\{1+\frac{dB}{du}\right\} V_1(u+B,0)\,, \tag{A.1}$$

$$\frac{dt}{du}Y(x_1) = \frac{dB}{du} + F(x_1) \tag{A.2}$$

$V_1$ denotes the partial derivative with respect to income. Solving (A.1) and (A.2) we get

$$\frac{dB}{du} = -\frac{Y(x_1)V_1\left(u+B,0\right) + x_1F(x_1)V_1[x_1(1-t)+B,e]}{Y(x_1)V_1\left(u+B,0\right) + [x_1 - Y(x_1)]V_1[x_1(1-t)+B,e]} \tag{A.3}$$

Since $Y(x_1) > x_1[1 - F(x_1)]$, we have $x_1F(x_1) > x_1 - Y(x_1)$. So we have $\frac{dB}{du} < -1$.

***Appendix B: Proof of Proposition 3***:

(i) We first show that a worker $y$ is better of, i.e. $B_2 - B_1 > y(t_2 - t_1)$ if $y \leq Y(x_1) + x_1F(x_1)$.

We let $u_1$ and $u_2$ be the value of UB before and after its reduction. The marginal worker's corresponding indifference conditions are:

$$V[x_1(1 - t_1) + B_1, e] = V(u_1 + B_1, e)$$

$$V[x_1(1 - t_2) + B_2, e] = V(u_2 + B_2, e) \tag{B.1}$$

Proposition 2 implies $u_2 + B_2 > u_1 + B_1$. We assume that a worker's marginal utility of income is lower when he works. Hence the income difference on the left hand side of (B.1) must be larger than that on the right hand side, i.e., $x_1(1 - t_2) + B_2 - x_1(1 - t_1) - B_1 > u_2 + B_2 - u_1 - B_1$, or $t_2 - t_1 < (u_1 - u_2)/x_1$.

From (2) we get $u_i = [t_iY(x_1) - B_i]/F(x_1)$, so $u_1 - u_2 = [B_2 - B_1 + t_1Y(x_1) - t_2Y(x_1)]/F(x_1)$. So

$$t_2 - t_1 < \frac{B_2 - B_1 + (t_1 - t_2)Y(x_1)}{x_1F(x_1)} \tag{B.2}$$

(B.2) implies $B_2 - B_1 > (t_2 - t_1)[Y(x_1) + x_1F(x_1)]$. If $y < Y(x_1) + x_1F(x_1)$, $B_2 - B_1 > y(t_2 - t_1)$.

(ii) We then show $B_2 - B_1 < y(t_2 - t_1)$ when $y \geq Y(x_1)/[1 - F(x_1)]$.

Since $u_2 + B_2 > u_1 + B_1$ and $u_1 - u_2 = [B_2 - B_1 + t_1 Y(x_1) - t_2 Y(x_1)]/F(x_1)$, we have $B_2 - B_1 >$ $[(t_1 - t_2)Y(x_1) + B_2 - B_1]/F(x_1)$, which implies $B_2 - B_1 < \frac{(t_2 - t_1)Y(x_1)}{1 - F(x_1)}$.

Hence we have $B_2 - B_1 < y(t_2 - t_1)$ if $y \geq Y(x_1)/[1 - F(x_1)]$.

***Appendix C: Proof of Proposition 4***:

Now we allow $x_1$ to fall to $x_2$, while lowering $u$, i.e. we have $u_2 < u_1$, $x_2 < x_1$, $B_2 > B_1$, and $t_2 > t_1$. To minimize the number of worse-off high-income earners by the UB reduction, we keep the unemployed indifferent, i.e. $u_2 + B_2 = u_1 + B_1$. We now show that $B_2 - B_1 > y(t_2 - t_1)$ for any $y < Y(x_1)/[1 - F(x_1)]$. As (2) implies $B_i = t_i Y(x_i) - F(x_i)u_i$, we have

$$B_2 - B_1 = t_2 Y(x_2) - t_1 Y(x_1) + F(x_1)u_1 - F(x_2)u_2 \tag{C.1}$$

Since $x_2 < x_1$, we get $F(x_2) < F(x_1)$. So $B_2 - B_1 > t_2 Y(x_2) - t_1 Y(x_1) + F(x_1)(u_1 - u_2)$. But $u_1 - u_2 = B_2 - B_1$, so $B_2 - B_1 > [t_2 Y(x_2) - t_1 Y(x_1)]/[1 - F(x_1)]$. Hence $B_2 - B_1 > y(t_2 - t_1)$ if

$$\frac{t_2 Y(x_2) - t_1 Y(x_1)}{1 - F(x)} > y(t_2 - t_1) \tag{C.2}$$

When $y < Y(x_1)/[1 - F(x_1)]$, (C.2) holds if $Y(x_2) > Y(x_1)$, which is guaranteed as $x_2 < x_1$.

***Appendix D: Proof of Proposition 7***:

Under pure *BI*, there is no unemployment, from (5) and the definition of $W(s)$ we get $B_2 = t_2(1 - t_2)^{\varepsilon} W(\alpha)$. It is maximized when we choose $t_2 = 1/(1 + \varepsilon)$, so $B_2 = \frac{\varepsilon^{\varepsilon}}{(1+\varepsilon)^{1+\varepsilon}} W(\alpha)$.

Under pure *UB* with $t_1$ and $s_1$, (4) implies $u_1 = \frac{s_1^{1+\varepsilon}}{1+\varepsilon}(1 - t_1)^{1+\varepsilon}$. So we have $B_2 > u_1$ if

$$\frac{\varepsilon^{\varepsilon}}{(1+\varepsilon)^{\varepsilon}} W(\alpha) > s_1^{1+\varepsilon}(1 - t_1)^{1+\varepsilon} \tag{D.1}$$

Since $W(\alpha) = \int_{\alpha}^{\beta} w^{1+\varepsilon} g(w)dw$ and $\overline{w} = \int_{\alpha}^{\beta} wg(w)dw$, Jensen's inequality implies $W(\alpha) > \overline{w}^{1+\varepsilon}$. Hence a sufficient condition for (D.1) is $\frac{\varepsilon^{\varepsilon}}{(1+\varepsilon)^{\varepsilon}} \overline{w}^{1+\varepsilon} > s_1^{1+\varepsilon}(1 - t_1)^{1+\varepsilon}$, or

$$\bar{w}\left(\frac{\varepsilon}{1+\varepsilon}\right)^{\frac{\varepsilon}{1+\varepsilon}} > s_1(1 - t_1) \tag{D.2}$$

When $1 + 1/\varepsilon = e$, the left hand side of (D.2) reaches its minimum, which is $0.7\bar{w}$. Hence we must have $B_2 > u_1$ if $0.7\bar{w} > s_1(1 - t_1)$.

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Hamburg Institute of International Economics (HWWI)

Heimhuder Str. 71 | 20148 Hamburg | Germany
Phone +49 (0)40 34 05 76 - 0 | Fax +49 (0)40 34 05 76 - 776
info@hwwi.org | www.hwwi.org