Equity and Efficiency Considerations, with an Illustration Using Austrian SILC Data

Unconditional Basic Income

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Abstract

The objection to an unconditional basic income is threefold. First, unconditionality is unjust, because it is at odds with reciprocity. Why should society grant benefits without demanding service in return? Second, a basic income is either too low to alleviate poverty or too high to be economically feasible. The disincentive effects caused by a tax rate necessary to sustain a basic income replacing conditional welfare would result in a reduction in economic efficiency. And third, unconditional payments are not only undeserved, but create strong incentives to drop out of the labor force, which again results in a reduction in economic efficiency. The aim of this thesis is the analysis of a basic income scheme in the light of the objections formulated above. As the analysis will show, a basic income is compatible with libertarian theories of justice and is in principle capable of improving economic efficiency.

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1 Introduction

The idea of an unconditional basic income can be traced back to Thomas Paine's plan to redistribute the 10^{th} part of the profits from the cultivation of land to all members of a political community, no strings attached.[1] Paine's reasoning follows John Locke's notion of the earth being common to all men.[2] With the proposal of a negative income tax in the 1960s, the idea of an unconditional payment found its way into economic literature. The Nobel laureates Milton Friedman[3] and James Tobin[4] were among the first to seriously consider the implementation of unconditional social security.

Still, more than any other topic in economic literature, the idea of a negative income tax or an unconditional basic income, a demogrant, a citizen's income, a social dividend, Grundeinkommen or Bürgergeld, or whatever an unconditional social security scheme is labeled, has been subject to an ongoing debate among both economists and philosophers.

The objection to an unconditional payment is threefold. First, unconditionality is unjust, because it is at odds with reciprocity. Why should society grant benefits without demanding service in return? Second, a basic income is either too low to alleviate poverty or too high to be economically feasible. The disincentive effects caused by a tax rate necessary to sustain a basic income replacing conditional welfare would result in a reduction in economic efficiency. And third, unconditional payments are not only undeserved, but create strong incentives to drop out of the labor force, which again results in a reduction in economic efficiency.

[1] Paine (in Foner, 1945), pp605.
[2] Locke (1764), sec27.
[3] See Friedman (1962).
[4] See Tobin, Pechman, Mieszkowski (1967).

The aim of this thesis is the analysis of a basic income scheme in the light of the objections formulated above. The first objection is normative. Therefore, the second chapter will provide an analysis of theories of distributive justice and will conclude with a model that is compatible with libertarian theories of justice and provides the normative basis of an unconditional income grant.

Chapter 3, labeled 'Efficiency', and chapter 4 address the (dis)incentive effects of unconditional social security. A model of the labor market with involuntary unemployment provides insight to the employment effects of conditional and unconditional social security schemes. Finally, a tax/benefit analysis identifies the redistributive impact of a basic income replacing means-tested social security.

The following pages provide a formal definition of an Unconditional (or Universal) Basic Income (UBI) and compare a UBI to similar conceptions of unconditional social security.

Definition

In a nutshell, "a basic income [...] is an income paid by the government to each full member of society (1) even if she is not willing to work, (2) irrespective of her being rich or poor, (3) whoever she lives with, and (4) no matter which part of the country she lives in"[5], or simplified: "A basic income is an income paid by a political community to all its members on an individual basis, without means test or work requirement".[6]

Its abdication of means testing is the major difference between a UBI and traditional benefit transfer systems like the Scandinavian welfare state or less comprehensive schemes like the US tax and welfare programs.

Means testing or conditionality in contrast to unconditionality operates ex post,

[5] Van Parijs (1995), p35.
[6] Van Parijs (in Ackerman, Alstott and Van Parijs 2003), p4.

scrutinizing a household's entitlement to benefits according to its total income, wealth and needs. A UBI, on the other hand, operates ex ante, transferring a cash grant irrespective of an individual's or household's income, wealth and needs.

Why Unconditionality?

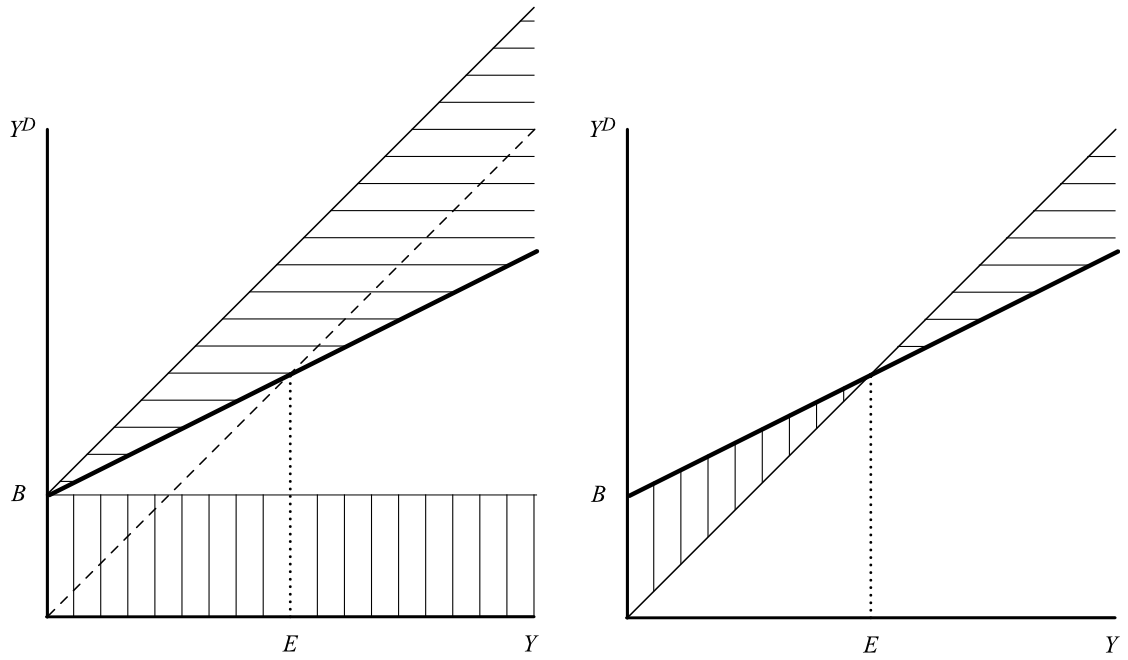
The conditionality of present welfare programs gives rise to a phenomenon known as the poverty or unemployment trap. Individuals participating in means tested welfare programs often face effective marginal tax rates of up to 100 percent or more. For a family participating in three US welfare programs (AFDC, EITC and FSP)[7], the benefit reduction rate, determining the withdrawal of social benefits for every dollar earned on the labor market, can boost the effective tax rate up to 89%.[8] A rise in gross labor market earnings from \$750 to \$1500 per month would raise the household's net income by only \$82. Because of the disincentives caused by high effective marginal tax rates, a household may find it optimal to supply no labor and to choose welfare instead. In a Basic Income Flat Tax scheme (BIFT), the marginal tax rate is equal for all agents. In the absence of benefit withdrawal, there is no difference between effective marginal tax rates and nominal marginal tax rates.

Further objectives of an unconditional basic income are the reduction of administrative costs, the elimination of the welfare stigma, incentives for continuing education, an increase in self-employment and a reduction of involuntary unemployment.

UBI or NIT?

However, work incentives can alternatively be increased by a linear negative income tax policy. Given equal tax rates and transfers, a linear Negative Income Tax

[7] AFDC: Aid to Families with Dependent Children; EITC: Earned Income Tax Credit; FSP: Food Stamp Program.
[8] Blundell and MaCurdy (1999), p1565.



Basic income flat tax on the left and linear negative income tax on the right. Y is gross income and Y^D disposable income. B is the minimum guaranteed income in both schemes and E is the break-even point of being a net beneficiary to being a net tax payer. Left of E, the average tax rate is negative. At the break-even point E, the average tax rate is zero and right of E the average tax rate is positive. Thus, despite constant marginal tax rates, both schemes are progressive.

Figure 1.1: A Basic Income Flat Tax on the Left and a Linear Negative Income Tax on the Right

(NIT), often traced back to Milton Friedman[9], can be designed to yield the same distribution of disposable income as a BIFT.

The NIT works like a refundable tax credit that decreases with the level of before tax income. A certain level of benefits, assumed to be equal to the level of an unconditional basic income, is provided even if an individual's income is zero. Thus, like a BIFT, a NIT decouples the payment of benefits from the willingness to work.

In practice, however, the NIT may deviate from a BIFT scheme. While a basic income is paid ex ante in regular installments, the NIT is paid ex post, after an applicant has filed her tax return.

The main reason to choose basic income over a NIT, however, is a normative one. I will show that a BIFT scheme is consistent with a theory of justice in libertarian manner based on Lockean principles. A negative income tax scheme simply balances taxes and benefits - under a basic income scheme the tax revenue is actually raised and the basic income is paid to all independently.[10] From a normative point of view, the independent payment of a basic income can be conceived as an entitlement to a share of society's natural resources. Friedman's negative income tax, on the other hand, is primarily conceived as a pure poverty alleviation or efficiency improving measure.

UBI or Initial Endowment?

Concentrating on normative aspects and considering the notion of the entitlement to a share of society's natural resources, wouldn't a one time payment at, say, reaching maturity be an alternative to a regular installment (which a UBI is assumed to be)?

[9] Friedman (1962), pp192.
[10] Van Parijs (in Ackerman, Alstott and Van Parijs 2003), p10.

Ackerman and Alstott have coined the notion of the "stakeholder society"[11]. At age 21 each citizen should receive $80000 as an initial endowment, paid in four annual installments of $20000 each. In a first stage the cash grant is funded by a 2 percent wealth tax. Second generation stakeholders are obliged to pay back their stake upon their death, if they can afford.

From a libertarian standpoint an initial endowment may be preferred to a regular installment, since the latter could be conceived as a paternalistic measure and would therefore be at odds with the responsibility ideal central to libertarianism. Van Parijs acknowledges the paternalistic character, or as he puts it the "mildly paternalistic" character of a UBI scheme and justifies it as a means to "protect [people's] real freedom at older ages against the weakness of their will at younger ages".[12] Milton Friedman on the other hand argues that "those of us who believe in freedom must believe also in the freedom of individuals to make their own mistakes".[13]

As the normative analysis of distributive justice will show, the reason to choose regular installments over an initial endowment is not a paternalistic one. In the 'stakeholder society' the initial cash grant can be conceived as a compensation for the part of the natural resources, say, a plot of land, an individual would be entitled to. In a 'shareholder society', on the other hand, an individual actually holds the share of natural resources she is entitled to and receives a regular dividend or "ground-rent"[14] from the respective property's occupant. And just like dividends are paid on a regular basis, so is the basic income.

The Unification of Equity and Efficiency

I will show that a basic income is compatible with classic libertarian thoughts, providing each individual with her legitimate share of natural resources while at

[11]Ackerman and Alstott (in Ackerman, Alstott and Van Parijs 2003), pp40.
[12]Van Parijs (1995), p47.
[13]Friedman (1962), pp188.
[14]Paine (in Foner, 1945), pp605.

the same time assuring a person's right to both self-ownership and property and that a UBI can improve efficiency by abolishing the poverty trap and involuntary unemployment in particular and by providing *equality of opportunity* in general. Equality of opportunity can be a measure to abolish the prevailing "misallocation of talent"[15] by reducing the importance of an individual's socioeconomic background to education and equal opportunity is a necessary condition for a just society. Hence, the notion of equal opportunity is the common denominator uniting equity and efficiency.

[15]See Mora (2007).

2 Equity

Different approaches to the question what is just have been offered. One, called the consequentialist or teleological ethics is based on the assumption that "the good is defined independently from the right, and then the right is defined as that which maximizes the good." (Frankena as cited in Rawls 1973, p22) The other, termed deontological ethics[16], on the other hand, "either does not specify the good independently from the right, or does not interpret the right as maximizing the good" (Rawls 1971, p26).

A prominent teleological theory that had great impact on economics is utilitarianism, which is "the ethical theory, that the conduct which, under any given circumstances, is objectively right, is that which will produce the greatest amount of happiness [utility] on the whole" (Sidgwick in Phelps 1973, p227) and "the striking feature of the utilitarian view of justice is that it does not matter, except indirectly, how this sum of satisfactions is distributed among individuals" (Rawls 1971, p23). However, if there is no noticeable difference of aggregated utility between two distributions, Sidgwick proposes to choose the more egalitarian one.[17] But "it should be observed that the question here is as to the distribution of *happiness*, not the *means of happiness*. If more happiness on the whole is produced by giving the same means of happiness to B rather than to A, it is an obvious and incontrovertible deduction from the utilitarian principle that it ought to be given to B, whatever inequality in the distribution of the means of happiness this may involve" (Sidgwick in Phelps 1973, p232).

[16] Deontological ethics is defined as being non-teleological and must not be confused with moral absolutism, the latter completely ignoring an act's consequences and focusing only on the rightness or wrongness of an act itself.

[17] See Sidgwick (in Phelps 1973), p232.

Considering the definition above, it can be asked whether utilitarianism is an ethical theory at all, since its emphasis is placed on efficiency considerations rather than providing a framework for the notion of equity. Utilitarianism in its pure form wouldn't condemn sacrificing a few if such a measure raised aggregate utility for the majority. Thus, pure utilitarianism is incompatible with pure libertarianism, since the latter is based on the notion of a person's inalienable rights to self-ownership and property as long as she does not infringe the inalienable rights of others.

2.1 Theories of Distributive Justice

In contrast to the utilitarian notion of maximizing happiness, most (deontological) theories of justice challenging utilitarian conceptions of justice emphasize the importance of the distribution of initial resources[18] in a Hobbesian or Lockean 'state of nature'. Although the conceptions of the state of nature vary from historical fact to mere thought experiment, what the theories have in common is their focus on the distribution of natural resources in this position. Robert Nozick, for example, developed in his major work "Anarchy, State and Utopia"[19] the emersion of the classical libertarian minimum state from the 'state of nature' in a laissez-faire way, guided by an invisible hand mechanism. John Rawls, on the other hand, conceived a social contract formed in the 'original position' by rational individuals behind a veil of ignorance.

Nozick's entitlement theory focuses on the procedural aspects of distributive justice. Three principles form Nozick's theory of justice in holdings: the principle of justice in acquisition, the principle of justice in transfer and the principle of justice in rectification. The first two principles specify the legitimate appropriation and transfer of holdings. "A distribution is just if it arises from another just distribution by legitimate means."[20] Past injustice from illegitimate acquisition or transfer of holdings such as theft, fraud, slavery, forcibly excluding others from competing

[18]Speaking with Sidgwick one could say the distribution of the 'means of happiness'.
[19]Nozick (1974).
[20]Nozick (1974), p151.

in exchanges, etc., should be rectified according to the principle of justice in rectification. Thus "whether a distribution is just depends upon how it came about."[21] For Nozick this is the major difference between his 'historical' theory of entitlement and what he calls 'end state' theories of justice like utilitarian conceptions and Rawl's theory of justice. 'End state' theories observe a distribution at a specific point in time ignoring the historic accumulation process eventually leading to a given distribution. For a welfare egalitarian, any two structurally identical distributions are equally just.[22] According to Nozick's entitlement theory, this is not necessarily true. What matters also is a distribution's history, hence whether a distribution has arisen by legitimate means.

Locke's Proviso

Nozick borrows the principle of acquisition of holdings from John Locke: "Though the earth, and all inferior creatures, be common to all men, yet every man has a property in his own person: this no body has any right to but himself. The labour of his body, and the work of his hands, we may say, are properly his. Whatsoever then he removes out of the state that nature hath provided, and left it in, he hath mixed his labour with, and joined to it something that is his own, and thereby makes it his property. It being by him removed from the common state nature hath placed it in, it hath by this labour something annexed to it, that excludes the common right of other men: for this labour being the unquestionable property of the labourer, no man but he can have a right to what that is once joined to, at least where there is enough, and as good, left in common for others."[23]

According to Locke, the principle of justice in acquisition is satisfied if 'there is enough, and as good, left in common for others'. Nozick gives a weaker interpretation of Locke's proviso by saying that someone is being made worse off "by no longer being able to use freely what he previously could"[24] and constrains it

[21]Nozick (1974), p153.
[22]Nozick (1974), p153.
[23]Locke (1764), sec27.
[24]Nozick (1974), p176.

to cases where someone appropriates the total supply of something indispensable to life like all drinkable water. "If the proviso excludes someone's appropriating all the drinkable water in the world, it also excludes his purchasing it all" and since this situation is most unlikely to ever occur in a free market due to the price mechanism, the proviso will never be applied.[25] Here Nozick is very imprecise. Although the proviso may never come into effect after the initial appropriation, it is probably violated in the initial process of acquisition.[26] Nozick states that the principles of acquisition and transfer do not justify a more extensive state than the minimum state, nor will the proviso override this.[27] Nozick apparently thinks that the invisible hand mechanism guiding the acquisition process is a sufficient condition to provide a just distribution of initial holdings. The idea of an invisible hand is introduced in contrast to Locke's social contract that constitutes the initial acquisition of holdings as an agreement of agents in the state of nature. However, 'where there is enough, and as good, left in common for others' is a constraint that does not automatically emerge from a laissez-faire process. What is appropriated is no longer available for others.

If Nozick were to seriously include the proviso in its original formulation, he couldn't dismiss equality of opportunity as a necessary condition for justice in holdings. Equal opportunity in the state of nature is a necessary condition to meet the requirements of the proviso. "Life is not a race in which we all compete for a prize which someone established"[28] is one of Nozick's objections to the notion of equality of opportunity. The initial acquisition of holdings, however, is similar to the organized races for a plot of land in 19th century America that provided equal conditions for all contestants. But is providing equal opportunity a sufficient condition to satisfy the proviso? Even back then there were probably more settlers than available land and since there were better and worse plots of land, envy among neighbors may have existed. Therefore, equal opportunity is only a necessary and not a satisfying condition to meet the requirements of the proviso. 'Enough, and as good, left in common for others' justifies to go one step further

[25]Nozick (1974), p179.
[26]This applies not only to Nozick's weaker interpretation but also to Locke's original formulation.
[27]Nozick (1974), p231.
[28]Nozick (1974), p235.

by introducing an additional condition that can provide a fair distribution along the lines of the proviso.

Equality of Resources

But what qualifies a distribution to be considered fair? Varian defines a fair distribution as a condition that is both equitable and Pareto efficient[29]. An equitable distribution is an allocation that provides every agent with the same initial bundle of resources. If in a second step the bundles were traded to a market equilibrium by means of a price mechanism, the resulting allocation would by definition be efficient. A Pareto efficient allocation emerges when all possible trades have been made. Pareto inefficiency emerges when exchanges are made outside the market's price system. The first welfare theorem states that a competitive market equilibrium allocation or Walrasian equilibrium is Pareto efficient.

Similarly, in "Equality of Resources", Ronald Dworkin presents a thought experiment of shipwreck survivors landing on a desert island and agreeing on dividing the island's natural resources equally among them.[30] Each individual is endowed with an equal amount of clamshells serving as a currency for acquisitions in an auction of the island's resources. The auction continues until market equilibrium is reached and the survivors are free to continue trading until no agent wishes to hold any other agent's final bundle of resources. Dworkin calls this the envy test; nobody would envy another's set of resources because she could have purchased another one's bundle instead of her own. If the available resources do not meet an individual's tastes in the first place, she will be unlucky with the auction, but she can't complain the distribution were unequal.[31] This is a major difference between theories of equality of resources and utilitarian theories of equality of welfare. Equality of welfare requires that all agents are equally happy with their holdings. In such a regime, an agent being unlucky because of her preferences

[29] A situation is Pareto efficient if it is impossible to make someone better off without making someone else worse off.
[30] Dworkin (1981), p285.
[31] Dworkin (1981), p287.

is entitled to a welfare equalizing compensation of some sort. If somebody had 'expensive tastes' like a preference for caviar and the best champagne, but only eggs and water were available, she would be entitled to a compensation that raises her level of well-being to the other agents' level.

Production and Labor

So far we have ignored the impact of production and labor on the allocation of resources. Imagine that at the end of a certain period an agent, let's call her Busy, succeeds in accumulating a bundle of resources another agent, let's call her Idle, envies. Busy used her initial resources for production while Idle spent her time lying in the sun. Assuming both Busy and Idle are equally talented[32], is Idle's envying Busy's bundle justified? Since Idle could have chosen the same way of life Busy did, thus using her initial resources for production instead of leisure, the answer is no. If labor is present and consumption-labor bundles are being compared, the envy test succeeds and the distribution is equal.

But what if individuals had equal tastes but different talents? In the former example Busy had a strong preference towards production while Idle preferred spending her time unproductively. Imagine two agents, Able and Disable. Able is a natural born farmer, everything he grows prospers. Disable on the other hand has a black thumb and everything he grows is of lesser quality. Both Able and Disable share the same preference for farming, but while Able has the natural ability it takes to be a successful farmer, Disable lacks the required ability. If talents are not part of the initial bundle of natural resources Disable has no more right to complain about the distribution than Idle had, because it is not merely the bundles of products that are being compared, but the combined consumption-labor bundles. Disable has to consider how much effort it would have cost her to compensate for her lack of talent and if she would have been willing to make the extra effort. There is no qualitative difference to the Busy/Idle example with equal talents and different tastes. The same is true if Disable were unable to compensate

[32]But have different preferences (or different discount rates).

for her poorer ability.

This might seem unfair when we think of handicapped agents. Varian addresses the issue of handicapped individuals subordinately. He considers it a secondary issue that could be handled in a variety of other ways such as insurance.[33] Let's assume a certain handicap is caused by someone's way of life, hence her tastes. This could indeed be dealt with by an insurance system of some sort. If all agents had perfect information about their risks, the decision to insure or not would be a matter of tastes and preferences. A risk averse heavy smoker would probably buy an insurance for the best medical treatment in case she developed lung cancer. But what are the implications of initial handicaps or handicaps following uncalculable risk like developing lung cancer without ever having smoked?

Probably Dworkin's solution is the most elaborate one.[34] Like many resourcist egalitarians he conceives talents as natural resources on par with a plot of land. Consequently, Dworkin defines initial handicaps a lack of talent, hence a lack of natural resources. Including ones internal endowments in the bundle of natural resources alters the outcome of the auction substantially. it is no longer only fertile land or fishing grounds that are being auctioned, but also individual talents. Auctioning off internal endowments is like trading an agent's labor force, hence trading the command over her time. An agent with rich internal endowment has to outbid anyone else who is interested in using her labor force if she wishes to retain command over her time. Agents with poor internal endowments can buy their own time cheaply and can appropriate more external endowments instead. Probably, the richer endowed have to use all their clamshells to buy their own labor and have nothing left to gain access to the external endowments. In the worst case the talented may have to buy their own labor on credit and are required to run a debt they pay back with their expected earnings. Since the resourcist theories of justice are immune to agents' different tastes, the richer endowed, irrespective of their preferences towards leisure or labor, are forced to work full-time in order to pay back their debt, if they want to or not. A preference towards leisure can

[33]Varian (1975), p244
[34]See Dworkin (1981).

simply be regarded an 'expensive taste'. This procedure puts the highly talented in an unfortunate position and is denoted the 'enslavement of the talented'.

Dworkin objects to the very implications of the auction's outcome when talents are part of the bundle of natural resources, since the envy test would forbid both being penalized for having a talent and being allowed to retain the benefits of superior talent.[35] But his argument is contrary to his own original definition of the envy test. Earlier, he defends the envy test by arguing that if the available resources do not meet an individual's taste in the first place, she will be unlucky with the auction, but she can't complain the distribution were unequal.[36] However, there is a major inconsistency in his arguments when we conceive internal endowments as 'available resources that do not meet an individual's tastes in the first place'. If Grace were a talented actress but hated performing in front of an audience and would rather plant tomatoes, her acting abilities could be considered 'available resources that do not meet her tastes in the first place'. But if her talent were known she had no choice but to become an actress, since the other agents would probably like to see her on stage and Grace would have to use her clamshells to buy her own labor force and had nothing left for bidding on a plot of land so she could grow tomatoes.

Considering the undesirable consequences for Grace's well-being, is there a different way to correct for handicaps without auctioning off talents? On the basis of Locke's proviso, I concluded that equality of opportunity is a necessary condition to meet the proviso's requirements. Reconsider the analogy of the race for a plot of land in 19th century America. In this context, equality of opportunity requires that all contestants have equal starting positions and are aware of the rules and regulations. Now imagine the regulations, including the date of the race and the location of the starting point, are announced exclusively by word of mouth. Some deaf person is not able to inform about the rules and regulations of the contest and will probably miss the race. A different deaf person who is lucky to have a friend to tell her about the regulations has the opportunity to participate. Equality of opportunity

[35]Dworkin (1981), p312.
[36]Dworkin (1981), p287.

means that agents with equal talents have equal opportunity irrespective of their social background. Applied to the former example, equal opportunity requires that the announcement is made in written form additionally, even if this means that some of the initial resources have to be used to meet the requirements. This must not be confused with the implications of the extended auction. Since the auction guarantees equality of resources including talents and handicaps and not only equality of opportunity, handicapped agents would be better off in the former than in the latter case.

Applied to Dworkin's extended auction or Varian's equal division and trade theory of fairness, equality of opportunity necessitates that procedures are open to all agents, whether they are they handicapped or not. The resources required to meet this necessary condition are to be provided from the pool of natural resources before the procedure starts. Thus, in the context of equality of resources, equality of opportunity can be considered a right to participate in the division and trade process.

The Difference Principle

John Rawls extends the condition of equality of opportunity to the notion of 'fair equality of opportunity' by, like Dworkin, including a person's internal endowments to the bundle of natural resources, but his famous 'difference principle' does not require *equality* of resources.[37] Rawls' final formulation of his two principles of justice is the following: First, "each person is to have an equal right to the most extensive total system of equal basic liberties compatible with a similar system of liberty for all" and second, "social and economic inequalities are to be arranged so that they are both: (a) to the greatest benefit of the least advantaged [...], and (b) attached to offices and positions open to all under conditions of fair equality of opportunity."[38] The first part (a) of the second principle of justice is the difference principle. According to Rawls, it is not the natural distribution of talent that

[37]Rawls (in Phelps, 1973), p339.
[38]Rawls (1971), p266.

is either just or unjust, but the importance society attaches to ones abilities.[39] Wilt, a gifted basketball player, wouldn't be able to charge his fans for seeing him play if there were no society. it is the existence of society that enables Wilt to benefit from his talent. Thus, society has the right to decide on the distribution of Wilt's profits. According to the difference principle, gifted agents are entitled to gain wealth only, if their gains help to improve the position of a society's least advantaged members of society.

The major difference between the difference principle and the extended auction is the former's abandonment of the notion of equality of resources. Although the difference principle shows a tendency towards equality, Rawls approves that some degree of inequality may improve society's overall efficiency and therefore the position of the least advantaged. These implications of the difference principle reveal the theory's 'end-state' character. it is the usefulness to society that determines the distribution of holdings. In Rawls' world agents with high earning power are useful as long as their gain helps improve the situation of the least advantaged members of society. The difference principle gives no guidance on how initial resources are to be distributed, nor does it describe how observed distributions came about. It just assumes that agents with rich initial endowment hold a greater share of society's assets and therefore are obliged to support the least advantaged.

The Veil of Ignorance

The tool Rawls uses to derive his two principles, however, is an attempt to apply pure procedural justice: 'the veil of ignorance'. The veil is a condition in the 'original position', a situation similar to the 'state of nature' that conceals the agents' randomly inbred or inherited features such as their tastes, talents and social status. But they do know about the circumstances of justice, about general facts of human society, they understand political affairs and know the principles of economic theory and human psychology. It is assumed that agents in the original position are rational and know that they would prefer to have more primary goods

[39] Rawls (1971), p87.

rather then less.[40]

Since the veil excludes knowledge of probabilities, agents do not have the data to calculate their expected utility. Thus, the agreement reached in the original position is the maximin rule.[41] Because everyone could be a potential member of the least advantaged group in society, the difference principle is the result of a rational decision subject to the veil of ignorance to insure against a worst case scenario.

The Principle of Rectification

Let's recall the conditions under which, following Nozick, rectification of past injustices is appropriate: theft, fraud, slavery, forcibly excluding others from competing in exchanges and the use of other illegitimate means in the process of acquisition and transfer of holdings. Two problems cross one's mind immediately: first, it can be reasonably assumed that every single holding could in theory be traced back to some violation of the acquisition and transfer principles at some time in history, considering our mixed history strongly influenced by wars, slavery, serfdom, aristocracy, dictatorships, and the like, and bearing in mind that minor violations of acquisition and transfer are still present in modern societies and probably are to persist. Second, in practice it is impossible to backtrack how a specific distribution came about. Therefore Nozick proposes to use a rule of thumb. "[...] assuming (1) that victims of injustice generally do worse than they otherwise would and (2) that those from the least well-off group in the society have the highest probabilities of being the (descendants of) victims of the most serious injustice who are owed compensation by those who benefit from the injustices (assumed to be those better off, though sometimes the perpetrators will be others in the worst-off group), then a rough rule of thumb for rectifying injustices might seem to be the following: organize society so as to maximize the position of whatever group ends up least well-off in the society."[42]

[40] Rawls (1971), pp119.
[41] See Rawls (1971), p133.
[42] Nozick (1974), p231

Quite astonishing, despite completely different approaches, Rawls' difference principle and Nozick's rectification principle yield similar results. Where Rawls assumes that better endowed agents hold a greater share of society's assets and may only retain their profits if doing so improves the position of the worst off, Nozick virtually says that the better off are obliged to help improve the position of the worst off, since the former are assumed to be the beneficiaries of past injustices.

2.2 Locke's Proviso Extended

The theories presented so far either concentrate on an initial generation's appropriation procedure or provide no coherent rules for the distribution of holdings. Following Locke, however, since "the earth, and all inferior creatures, be common to all men," the past, current and future generations are equally entitled to the world's natural resources. On first sight this might seem an impossible condition to satisfy. Once everything is appropriated there is nothing left for future generations, not enough and definitely not as good. But there is a possible solution to this dilemma.

Think of the initial generation of agents as entrepreneurs and the initial stock of resources as the economy's available capital stock. In the state of nature the stock is commonly owned by current and future generations. Assuming an infinite number of future agents, the initial generation is no longer entitled to the whole available stock of resources, but only to an infinitesimally share of it. Since it wouldn't make any practical sense to restrict the initial appropriation process to a finite number of infinitesimally small properties, the initial acquisition and transfer process is conducted in the same way it would have been conducted in the special case limited to one generation of agents. The difference, though, is the fact that agents have become shareholders rather than unconfined owners of the stock.

It is reasonable to determine an agent's share of the natural resources by dividing the initial stock by the number of agents at a specific point in time. Assuming an initial number of agents, N, each agent is entitled to use $1/N$ of the stock of

resources. Assuming further zero population growth, no technological progress and that the first generation ceases to exist as soon as the second generation turns up, the agents' starting positions differ according to their inherited wealth.[43] Thus, the distribution of wealth depends largely on the first generation's production and trading process.

Satisfying the proviso for the second generation implies the reestablishing of an equal division of initial resources. it is extremely important to differentiate between initial resources and, as Locke puts it, wealth generated by mixing one's labor with it. Redistributing the complete stock of holdings, including initial resources and the product of one's labor, would violate agents' property rights or as Thomas Paine argues, "while [...] I advocate the right, and interest myself in the hard case of all those who have been thrown out of their natural inheritance by the introduction of the system of landed property, I equally defend the right of the possessor to the part which is his".[44] Thus, agents who have inherited more than the N^{th} share of initial resources have to return the excess to agents who have inherited less or, if the respective resource has been improved by mixing labor with it, the latter become shareholders of the improved resource and are entitled to a share of the holding's future profits, the size of the share being equal to the fraction of initial and improved value, hence being equal to the improved value minus labor input.[45]

Assume an agent has built a farm on a plot of uncultivated land. She used more than the N^{th} share of initial resources for her enterprise. Her beneficiary has to either rectify the excess resources, or she has to share the excess land's harvest with a disadvantaged agent. The latter has the right to claim a share being equal to

[43] Generalizing the procedure for positive population growth and/or technological progress is straightforward. Since initial natural resources are constant, a growing population reduces per capita entitlements to initial resources. The opposite is true for technological growth. Technological progress implies productivity growth, hence makes a holding more profitable. And since agents are shareholders, technologically induced profit gains increase the value of their share in absolute terms.

[44] Paine (in Foner, 1945), pp605.

[45] This is similar to Paine's notion of a ground-rent that every proprietor of cultivated land owes to the community (Paine in Foner, 1945, pp605).

initial boondock's revenues divided by productive farmland's revenues. Assuming further that the fruits of a plot of uncultivated land generate a profit of \$100 and farmland's fruits gain a \$1000, the disadvantaged agent is entitled to one tenth of the excess property's future profits. Thus, in the former example initial resources' products are worth 10 percent of a holding's current revenue.[46]

Except for the share of resources she is entitled to, only an agent's labor share of total income is properly hers. Capital's share is distributed to each agent who is entitled to the respective resource. In modern economies, Paine's 90 percent probably are no longer a good approximation for labor's share on total income, if they ever were.[47]

Shareholder Value Added

The obvious policy for maintaining equality of resources is taxing away capital's share and distributing the tax revenue equally among all agents. Conceive the initial appropriation as a *mutual entitlement* to each others initial endowments. Agents may use the N^{th} share of the common pool of initial resources and each agent mutually holds a share of $1/N$ of each agent's N^{th} share of the total stock. If 10 percent of the total profit are due to initial resources and 90 percent are due to an agent's labor, each agent is entitled to $0.1/N$ of each other agent's profits and keeps $1-(N-1)*0.1/N$ of her own profits. Generalizing yields

$$Y_i^D = \left(1 - \frac{N-1}{N}\alpha\right) Y_i + \frac{1}{N}\alpha \sum_{i=1}^{N} Y_i - \frac{1}{N}\alpha Y_i, \qquad 0 < \alpha < 1, \tag{2.1}$$

where α is capital's share of value added, N is the population, Y_i^D is individual disposable income and Y_i is individual income. The first term reflects an agent's

[46] "Cultivation is at least one of the greatest natural improvements ever made by human invention. It has given to created earth a tenfold value." (Paine in Foner, 1945, pp605).

[47] Gomme and Rupert (2004) report a rather constant US labor share with an average rate of 71.7 percent from 1970 to 2002, Blanchard and Giavazzi (2001) analyze four OECD countries and assert a constant decline of labor's share from the early 1980s to a low of 60 to 65 percent in the 1990s and Guscina (2006) reports roughly 52 percent for highly developed OECD countries in the second half of the 1990s.

disposable income in consideration of her N^{th} part of the N^{th} share of resources she may use for production without restrictions. The second and third term describe the rent she receives from her N^{th} part of the other agents' shares of resources.

Consider the example of Busy, Idle, Able and Disable who are mutually entitled to an equal share of each other's profits. Each agent holds one forth of the other three agents' resources additional to her own forth and is entitled to a share of the other agents' profits of $1/4 * 0.1$, hence one fortieth. Let's assume that Busy's profit is \$200, Idle's profit is zero, Able earned \$500 and Disable \$100. According to the scheme Busy is entitled to one fortieth of Idle's profits, hence zero, one fortieth of Able's, hence \$12.5 and one fortieth of Disable's profits, hence \$2.5. Busy can keep $1 - 3/40$ of her profits, hence \$185. In sum, Busy ends up with \$200. A tax rate of 10 percent would have left her \$180 at first and an equal distribution of the tax' revenue of \$80 (10 percent tax on \$800 total profit) leaves her with \$200. The procedure is straightforward for the other agents. Idle is entitled to \$20, Able ends up with \$470 and Disable holds \$110. By simplifying expression (1.1), the labor and capital components of an agent's income can be emphasized:

$$Y_i^D = (1 - \alpha)\, Y_i + \frac{1}{N}\alpha \sum_{i=1}^{N} Y_i. \tag{2.2}$$

The first term is an agent's labor income and the second term is an agent's capital income. The second term can alternatively be expressed as capital's share of total per capita income:

$$Y_i^D = (1 - \alpha)\, Y_i + \alpha \frac{Y}{N}. \tag{2.3}$$

Substituting capital's share with the tax rate, t, and labor's share with $(1 - t)$ respectively, yields an agent's after tax income:

$$Y_i^D = (1 - t)\, Y_i + t \frac{Y}{N}, \qquad 0 \leq t \leq 1. \tag{2.4}$$

it is interesting to note that expression (2.4) is consistent with Rawls' difference principle. An increase in total income automatically benefits the least advantaged

members of society.

A further implication of the tax/benefit scheme is the fact that an agent's disposable income equals her income before taxes, if the latter matches exactly the economy's per capita income. If all agents had equal external and internal endowments, including their preferences, each agent's income would be exactly Y/N. A scheme of equality of resources including *all* internal endowments would generate exactly this outcome, or as Roemer states: "There is [...] no sustainable distinction between equality of resources and equality of welfare, when resources are taken to include internal attributes of people."[48] Since equalizing incomes is not what most people think is a just distributive policy, this is one more reason to exclude an agent's internal endowments from the initial bundle of resources.

Table 2.1: The Distribution of Income in a Four Agent Economy

	Disposable income					
t	Busy	Able	Disable	Idle	Aggregate income	Basic income
0%	$200	500	100	0	800	0
10%	200	470	110	20	800	20
50%	200	350	150	100	800	100
100%	200	200	200	200	800	200

The following chapter provides an overview of the economic implications and the practical execution of the scheme. The focus of the analysis is going to be on efficiency and sustainability of a basic income flat tax scheme according to the findings of the current chapter.

[48] Roemer (1986), p752.

3 Efficiency

The second welfare theorem states that every Pareto efficient allocation can be achieved by a decentralized, competitive market mechanism leading to a market clearing, Walrasian equilibrium. It implies that distributional and efficiency concerns can be separated: "If an allocation is a point of maximum welfare of some particular welfare function, it can be achieved by a suitable reallocation of endowments followed by trading to a market equilibrium." (Varian, 1975, p232)

it is not necessary to actually distribute physical endowments in order to establish a certain distribution, it is enough to redistribute the endowments' respective purchasing power by means of a tax/benefit system: "Equity is obtained thanks to income transfers that allow to disconnect the final distribution of welfare from the distribution of wealth that would result from the ex ante distribution of endowments and rights and the ex post price structure." (Guesnerie, 1995, p356)

Unfortunately the introduction of tax financed transfers affects economic behavior. The decision to work or not to work, for example, is closely intertwined with the tax rate on labor and the level of benefits.

Taxing an agent's internal endowment directly, however, would avoid the distortionary effect of taxation. If it were possible to measure all agents' IQs, we could levy a tax on individuals with high IQs and redistribute the revenue to individuals with low IQs - no deadweight loss would result from this kind of taxation.[49] However, aside from the practical difficulties of measuring personal endowments, such a tax scheme would be incompatible with the theory of justice outlined in

[49] Varian (2001), p514.

the previous chapter, since an individual's personal endowment is properly hers and the redistribution of internal resources would violate an individual's right to self-ownership.

Therefore, lump-sum taxation of internal endowments is neither fair nor feasible. Adding a constraint like the practical impossibility of lump sum transfers automatically leads to second- best solutions. The 'Ramsey principle of equalizing tax across groups, commodities and time', for example, states that goods with the most inelastic demands and supplies should be taxed most heavily.[50] The major flaw of many second-best analysis, however, is their unconfined support and implementation of what Stiglitz calls the 'neoclassical paradigm'.[51] Scrutinizing the plausibility of the assumptions made by neoclassical economics may yield completely different solutions, since Arrow-Debreu type models are heroic abstractions from real world economies.

It is due to informational constraints in a less narrowly defined economic framework that lump-sum transfers are inapplicable for the redistribution endowments in an equitable manner.[52] Furthermore, informational constraints also cause laissez faire to be inefficient.[53] Thus, the very implication of informational constraints is not only the impossibility of first-best solutions, but also the absence of Pareto efficient allocations in a laissez faire economy.

Figure 3.1 shows the utility possibility frontier for a two person economy. According to the neoclassical paradigm, a laissez faire economy would settle at a point like A directly on the utility possibility frontier. Lump sum transfers could theoretically be used to achieve a more equitable allocation represented by point A'. If lump sum transfers were not feasible, a second-best solution would lead to a more equitable but less efficient distribution such as A''. The utility feasibility frontier represents the economy's utility possibility frontier given the government's informational constraints. All points lying directly on the utility feasibility fron-

[50] See Ramsey (1927).
[51] See Stiglitz (1994).
[52] Stiglitz (1994), p45.
[53] Putterman, Roemer and Silvestre 1998, p864.

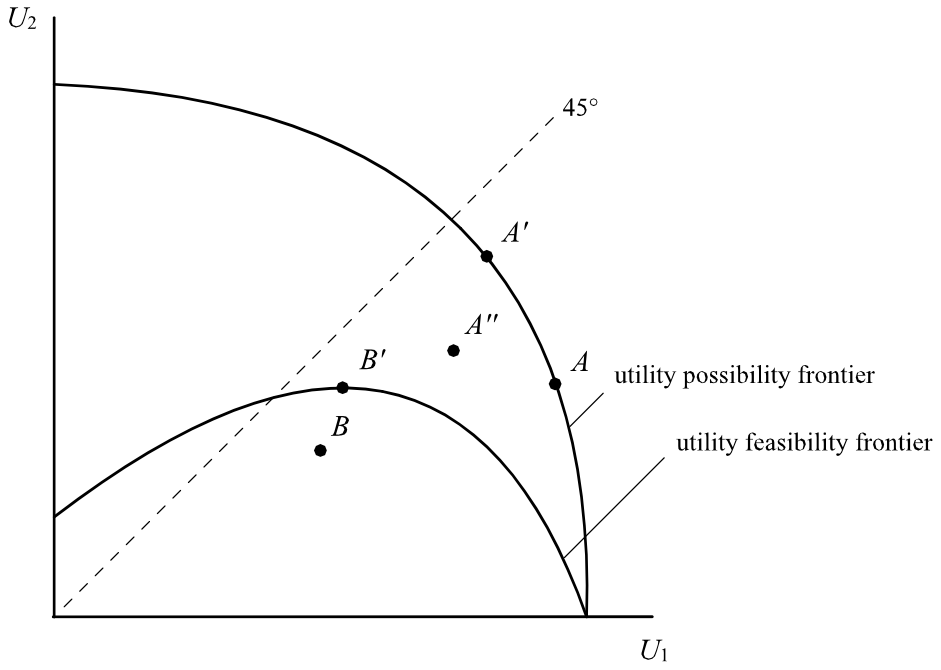


Figure 3.1: The Utility Possibility Frontier

tier are *constrained* Pareto efficient. Given imperfect information and incomplete risk markets, laissez faire would not even lead to a constrained Pareto efficient allocation, but rather to an allocation inside the utility feasibility set such as point B. Thus, government interventions could improve both equity and efficiency.

The fact that the second welfare theorem does not hold in the presence of informational constraints means that *efficiency and equity considerations can't be addressed separately*. Second-best policies always make distributional judgements and applying first-best reasoning in a second-best world can yield rather awkward results.[54]

[54]For examples see Blackorby (1990).

3.1 Social Choice

"The principle of efficiency does not by itself select one particular distribution of commodities as the efficient one. To select among the efficient distributions some other principle, a principle of justice, say, is necessary." (Rawls, 1971, p59)

Considering the consequences of the indefensibleness of the second welfare theorem in real world economies, economics has to rethink its one-sided approach to efficiency concerns, while ignoring equity considerations in its analysis. However, in order to embrace equity issues, we have to know where on the utility possibility frontier we want to be.

The normative analysis in the previous chapter concluded that a basic income flat tax scheme is a just redistributive policy, consistent with libertarian thoughts. Whether a BIFT policy is implemented or not, however, depends on individual preferences. Since the basic income is subject to a balanced budget constraint, agents simply choose between different tax rates according to the resulting utility. A common political procedure of choosing between alternatives is majority voting.

In case the voting decision is subject to a one-dimensional choice like choosing between different tax rates, individual preferences can be ranked in linear order. If individual preferences are single-peaked[55] with respect to the same linear order, the median voter model can be applied to determine a majority voting outcome. If we assume that agents with earnings below the mean income are in favor of a basic income and vote for a positive tax rate, while agents with earnings above the mean are against positive tax rates, the position of the median agent determines the tax rate chosen. Is the median income less than the mean income, the median agent prefers a positive tax rate.

Unfortunately, the median voter model is unreliable in case of multidimensional voting decisions. Atkinson gives an example of Condorcet's paradox, which illustrates how majority voting fails, if agents were to choose between three alternative

[55]The utility associated with different tax rates has a unique maximum.

tax/benefit structures[56]. Agents choose between alternative A, a flat tax with medium social security, B, a graduated tax with high social security, and C, a graduated tax with low social security. There are three groups of agents, namely the poor, the rich and the middle income earners. The poor only care about the level of social security and choose B over A and A over C. Middle income earners do not benefit from the social security system and prefer low tax rates. Therefore, they prefer C over B and B over A, since middle income earners are assumed to face tax rates below the flat tax rate in graduated tax structures. The rich, eventually, prefer the flat tax system, A, over C and C over B. The tax rates for the rich are assumed to be higher in graduated tax structures than in the flat tax case, which is true for both low and high social security. In pairwise votes, $B \succ A, C \succ B$, but $A \succ C$. Thus, forming a social preference relation is not possible, since the voting's outcome is intransitive.

With such difficulties in mind, social choice theory is concerned with functions that are able to translate a set of individual preferences into a social preference relation. According to Arrow, the minimal properties of such a *social welfare function* are (1) unrestricted domain, which, together with the transitivity requirement, rules out majority voting, (2) the weak Pareto principle, which states that society should choose state A over state B if each agent prefers state A over state B, (3) independence of irrelevant alternatives, stating that social preferences over any two states A and B depend only on individual preferences over A and B, and finally (4) nondictatorship, meaning that there is no agent who can enforce her individual preference as the social preference on every social choice to be made. The impossibility theorem states that it is impossible to satisfy all four conditions at the same time, if there are at least three alternative social states to vote for. Assuming that the first three assumptions hold, what follows is a dictatorship of one agent, enforcing her individual preference to be the social welfare function.[57]

Fortunately, there is a way out of the dilemma. Arrow's assumptions imply interpersonally noncomparable utility measured on an ordinal scale. If we relax either

[56] Atkinson (1995), p83.
[57] See Jehle and Reny (2001), pp243.

the noncomparability or ordinality assumption or both, a sensible and nondictorial social welfare function can be constructed.

First, let's consider the case of relaxing the noncomparability assumption, as suggested by Blackorby, while retaining ordinal scale utility. In contrast to the notion of cardinal utility, which states that utility is measurable in absolute levels, ordinal utility makes judgements about welfare by comparing an agent's possible social states and ranking the latter according to the agent's preferences. The ordinal scale assumption on utility enables us to make statements like 'Able is better off in state A than Able would be in state B'. Relaxing the assumption of noncomparable utility enables us to make statements like 'Able is better off in state A than Disable would be in state B'.

An example of a social welfare function requiring interpersonal comparison of utility on an ordinal scale is Rawls' maximin criterion. The Rawlsian social welfare function represents Rawls' difference principle. In the context of efficiency, the difference principle can be interpreted as stating that an improvement in economic efficiency has to make the least advantaged members of society better off. Identifying the least advantaged members of society requires the assumption of fully comparable ordinal utility across individuals.

Blackorby gives an example of how such comparisons can be made.[58] Most western economies have introduced poverty lines, measuring not only the magnitude of poverty, but also providing a benchmark for the welfare state's decisions on the level of social benefits. These poverty lines are the result of interpersonal comparison of utility, representing an ethical criterion for distributional judgements. Rawls suggests that the least advantaged be the ones with relative income less than society's median income, which is a common definition for poverty lines likewise.[59]

[58]Blackorby (1990), pp766.
[59]Rawls (1971), p84.

A major difference between the Rawlsian welfare function and, say, the traditional utilitarian welfare function, is the former's retaining of ordinal utility. The purely utilitarian welfare function assumes cardinal scale utility, since it ranks social states according to the sum of utilities. Combined with the notion of 'incrementally comparable utility'[60] across individuals, statements like 'Disable gains more utility from a move from point B to point A than Able would' can be made. Cardinal utility though, is a rather dubious concept. Measuring utility like mass on a scale and equivalently making statements like 'I lost 20 utility units' in a week is hardly possible.

Nevertheless, following Arrow's impossibility theorem and 'the von Neumann Morgenstern theory of choices involving risk'[61], the notion of cardinal utility celebrated a revival in the 1950s. Neo-utilitarianists like Harsanyi and Vickrey applied the von Neumann-Morgenstern utility function to welfare economics, combining the concept of risk aversion with the traditional utilitarian welfare function.[62] The idea behind a neo-utilitarian welfare function is that agents "maximize 'moral expectation', defined as a weighted average of the utilities associated with the different possible outcomes resulting from a given choice, the weights being proportional to the probabilities of these outcomes" (Vickrey in Phelps, 1973, p287). Thus a neo-utilitarian welfare function must be a constant elasticity of substitution (CES) function, such as

$$W = \left(\sum_{i=1}^{N} U_i^{1-\rho} \right)^{\frac{1}{1-\rho}}, \tag{3.1}$$

where ρ is the parameter of a society's inequality aversion. If $\rho = 0$, society is indifferent to the distribution of welfare and the function equals the traditional utilitarian welfare function. As $\rho \to \infty$, society's aversion to inequality increases and the function becomes similar to Rawls' maximin utility function.

[60] This means that utility gains (or losses) are comparable (Jehle and Reny 2001, p251).
[61] See Jehle and Reny (2001), pp97 for a detailed introduction to von Neumann-Morgenstern expected utility functions.
[62] See Harsanyi (1953) and Harsanyi (in Phelps 1973).

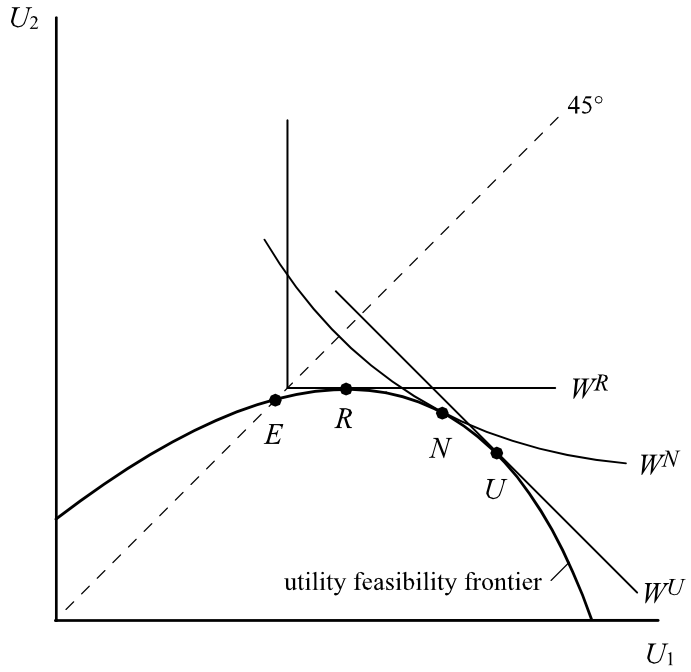


Figure 3.2: Social Welfare Functions

Figure 3.2 shows the social optima of different social welfare functions. The purely utilitarian welfare function, W^U, implying risk-neutrality and complete social indifference to the distribution of welfare ($\rho = 0$) chooses U, hence accepting a high level of inequality. The risk-averse neo-utilitarian optimum, N ($0 < \rho < \infty$), is left of U. Agents in the original position, behind the veil of ignorance, would choose R ($\rho = \infty$). Since they have no information on probabilities they can't calculate their expected utilities and agree to a more equal distribution.

Remember that the neo-utilitarian welfare function can yield exactly the same result, namely point R, once we assumed individuals actually were in a state like the original position. Behind a veil of ignorance risk-aversion and uncertainty would lead them to a distribution according to the difference principle. However, the reasoning for the difference principle is completely different. Even if information on probabilities were available in the original position, it wouldn't be wanted. As stated in the previous chapter, the veil of ignorance is a tool to derive moral con-

straints society can agree on. The completely risk-phobic neo-utilitarian outcome resulting from actual informational constraints follows the utilitarian dictum of maximizing the good irrespective of moral side constraints.

The important property of a distribution based on the difference principle, on the other side, is the implementation of the notion of (fair) equality of opportunity. The resourcist egalitarian approach of both Rawls' theory of justice and the shareholder scheme proposed in the previous chapter is different to outcome oriented social welfare functions, be it purely utilitarian, neo-utilitarian or neo-egalitarian[63] ones, even if the optimum of a neo-utilitarian social welfare function coincided with state R, because the former's main concern is not the distribution of welfare, but equality of opportunity as an end in itself.

Remember from Chapter 2 though that the difference principle is not strictly resourcist egalitarian, since Rawls' broad interpretation of natural resources includes a person's internal endowment. Because of possible negative effects on efficiency, complete equality of both internal and external endowments could eventually be to the disadvantage of the least advantaged group. The shareholder approach, on the other hand, is indeed resourcist egalitarian, but contrary to Rawls excludes a person's internal endowment from the bundle of natural resources.

Within an outcome oriented utility based framework there is no qualitative difference between the difference principle, the shareholder approach or even Nozick's rectification principle. In terms of utility, the maximin criterion can be applied likewise for each scheme. The advantage of the shareholder approach, however, is its *endogenous* derivation of a *regular installment*, while both the difference and rectification principles depend on an *exogenous* definition of the *least advantaged* members of society.

We can generalize the difference between libertarian and utilitarian (welfarist) approaches to distributional concerns by using Sidgwicks terminology: Utilitarians care about the distribution of happiness (utility), while libertarians emphasize the

[63]The neo-egalitarian optimum is represented by welfare equalizing state E.

importance of the distribution of *the means of happiness* (resources).[64]

3.2 (Dis)Incentives: The Equity Efficiency Tradeoff

Each of the discussed distributions can be achieved by a specific tax/benefit policy. A utilitarian distribution U, for instance, requires lower and/or regressive taxes and yields less benefits for the least advantaged than a neo-egalitarian distribution E, which can be achieved only by a highly graduated tax structure. As stated at the beginning of this chapter, levying taxes and granting benefits alters agents' behavior, hence distorts the labor market, at least within an Arrow-Debreu competitive economic framework. For simplicity reasons, the following analysis of basic aspects of labor supply in the context of a BIFT model remains within the limitations of an Arrow-Debreu economy.

Assumptions

The standard textbook model of labor supply assumes that agents maximize their utility by choosing between a composite consumption good and leisure. Consumption is represented by disposable income. The model assumes that an agent maximizes her utility according to her preferences between leisure and consumption subject to her individual budget constraint $Q_\tau R_\tau$[65].

Labor is assumed to be divisible. Thus, an agent may choose supplied hours of work without restrictions. If the agent's highest attainable indifference curve is tangential to her budget constraint at point E_τ, she supplies L_τ hours of labor.

Since we are interested in the labor supply response to changes in the tax/benefit structure, an individual agent's gross wage rate, w_i, is assumed to be fixed throughout the following analysis ($w_i = \bar{w}_i$).

[64] See Sidgwick (in Phelps, 1973), p232.
[65] Lowercase τ is a time index.

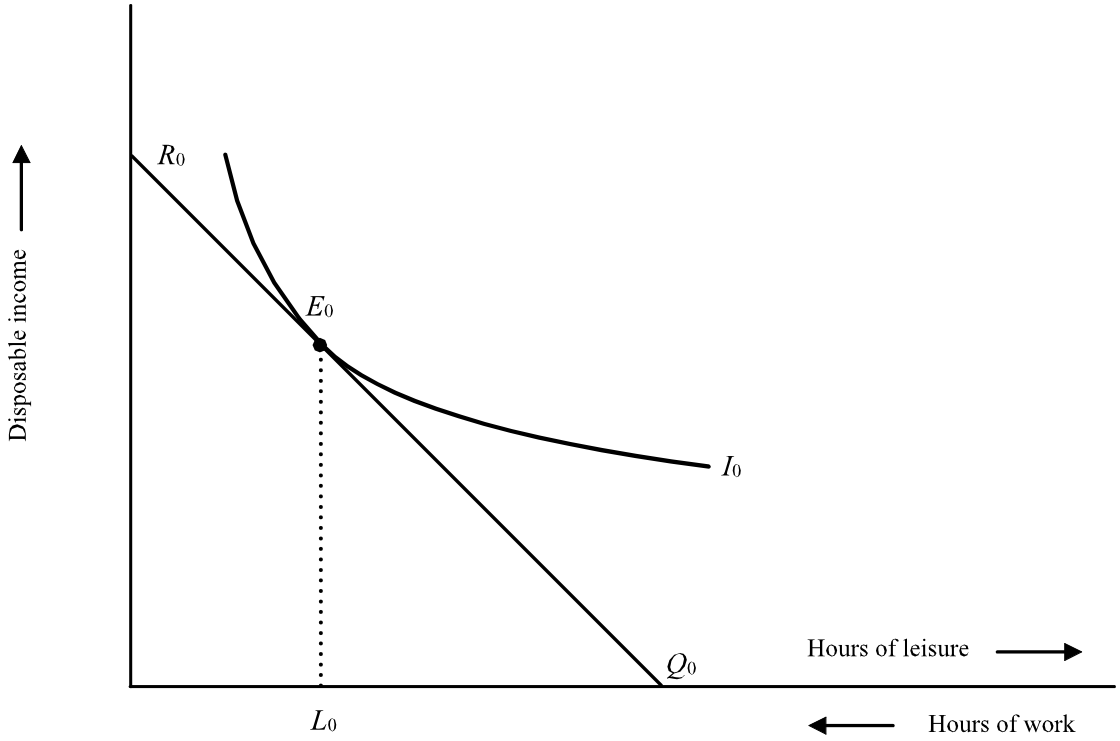


Figure 3.3: The Income Leisure Tradeoff

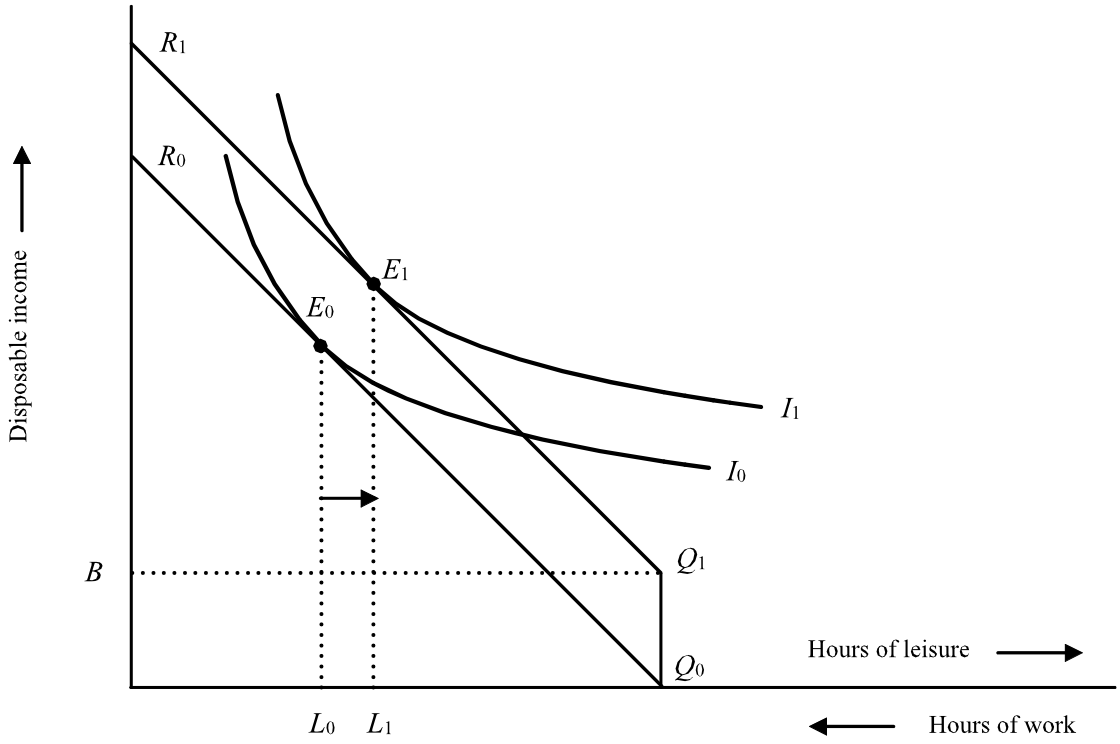


Figure 3.4: A Pure Income Effect

A Graphic Analysis of Labor Supply Effects

Introducing income from other sources than labor like an unconditional basic income shifts the individual budget constraint up by the amount of the respective non-labor income (distance Q_0Q_1 in figure 3.4). Assuming that both consumption and leisure are normal goods, the agent will consume more of both, resulting in an increase of leisure and consequently a reduction of individual labor supply from L_0 to L_1 as the agent moves from point E_0 to point E_1.

What we observe is a pure income effect that is not distortionary. The shift of the budget constraint does not affect the return to working more or less, because the marginal rate of substitution and the marginal rate of transformation both are represented by the net wage rate, which is left unchanged.[66] A lump-sum tax like

[66]Brown (1983), p4.

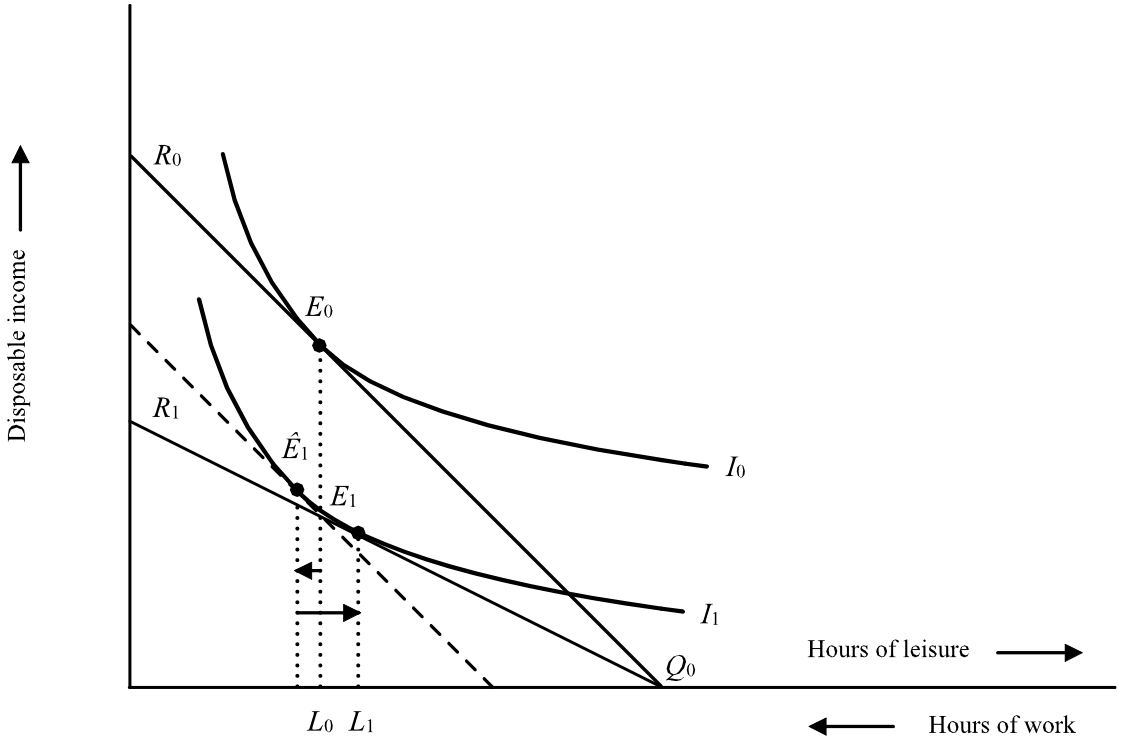


Figure 3.5: Income and Substitution Effects with Proportional Tax on Earned Income

a poll tax levying an equal amount per agent works analogous, but in the opposite direction.

A proportional tax on income reduces the net wage rate, which accords to a downward twist of the budget constraint from Q_0R_0 to Q_0R_1 (see figure 3.5). An individual's disposable income is

$$Y_i^D = (1 - t)\,\bar{w}_i L_i, \tag{3.2}$$

where t $(0 \leq t \leq 1)$ is a proportional tax on income and L_i is hours of labor supplied, given the level of t.

L_1 can be either greater or less than L_0. The direction of the overall effect depends on the magnitudes and directions of both income and substitution effects. The

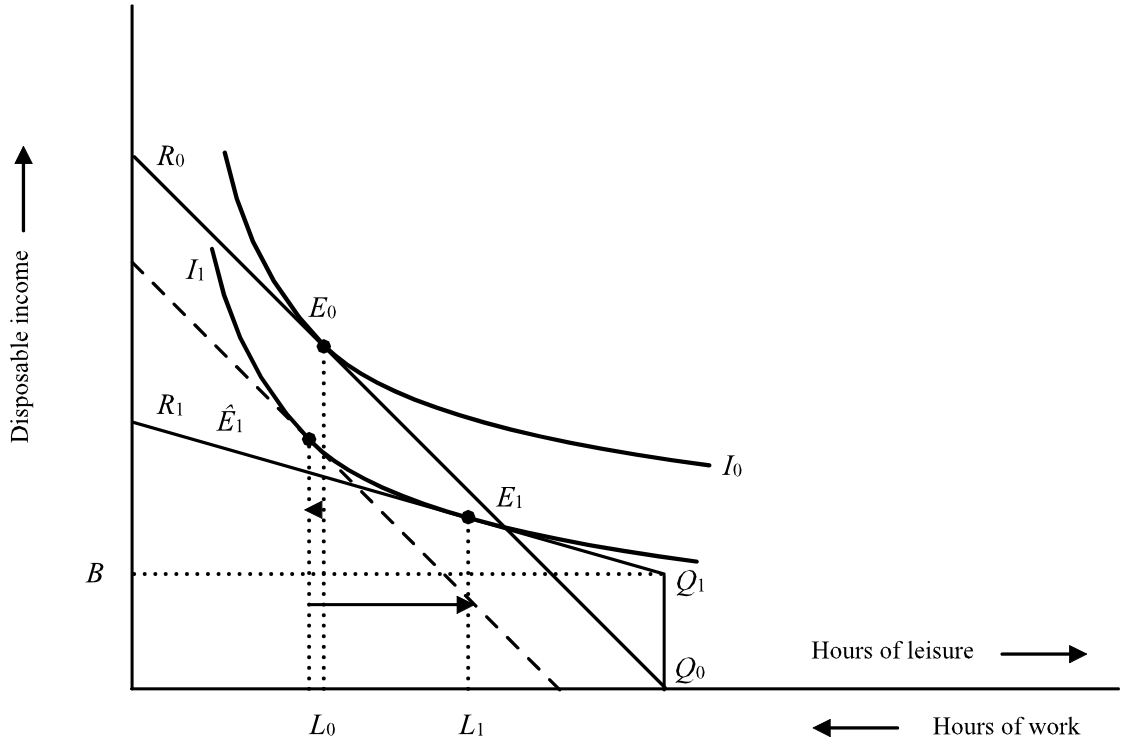


Figure 3.6: Income and Substitution Effects with Basic Income and Proportional Tax on Earned Income

income effect of a tax is assumed to be positive: a tax on income can act as an incentive, making an agent work more to compensate the loss caused by the tax (see figure 3.5). With a pure income effect, the agent would have ended up at the tangency point $\hat{E}_1$ of a lower indifference curve and the dashed budget constraint, being parallel to the old one.

The substitution effect, on the other hand, is negative: a tax on income acts as a disincentive, reducing the value of an extra hour of work and making leisure relatively cheaper, which leads to a reduction in labor supply. In figure 3.5 the substitution effect dominates the income effect, the overall impact of the income tax is a reduction in labor supply from L_0 to L_1.

Figure 3.6 shows the possible impact of a basic income flat tax policy. The no

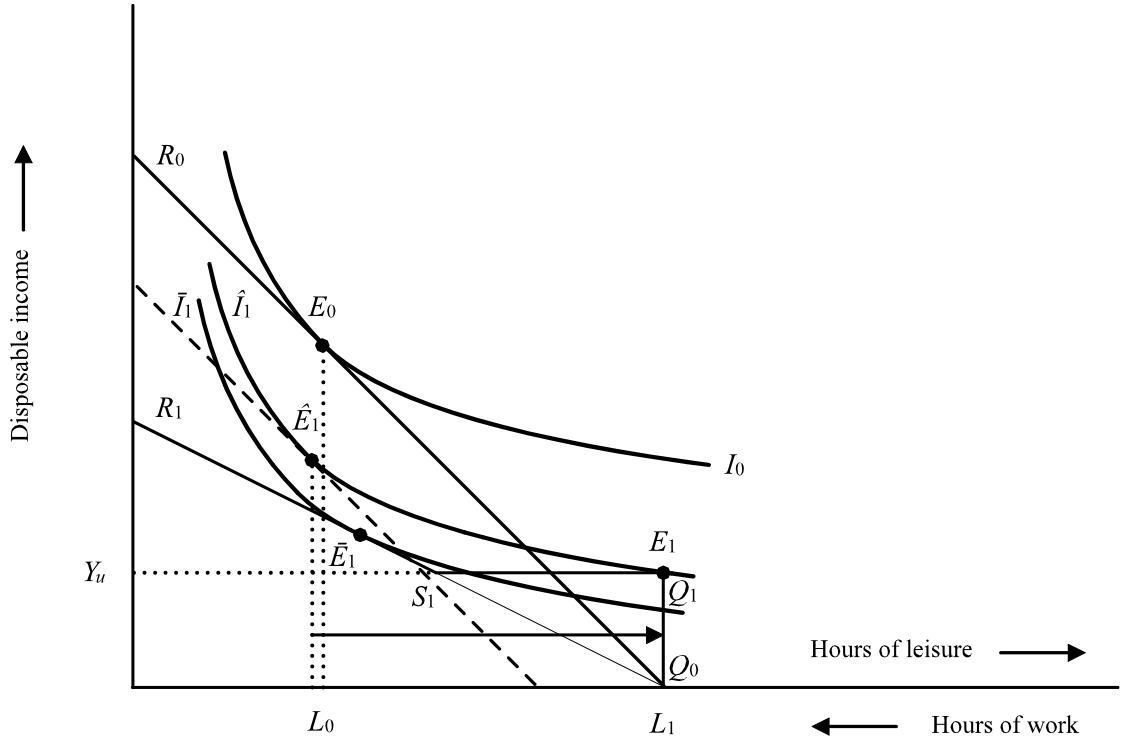


Figure 3.7: A Corner Solution: The Conditional Welfare System

tax/no benefits budget constraint Q_0R_0 shifts from Q_0 to Q_1 and twists downward according to the tax rate affordable to finance the basic income B. Again, the overall outcome is ambiguous, depending on the tax rate, the level of the basic income and an agent's preferences. However, compared to a proportional tax system without basic income and an equal tax rate, t, the income effect is either positive but smaller, or negative, depending on the level of the basic income.

In the examples discussed above, there has always been a point of tangency between an agent's indifference curve and her budget constraint. What has been ignored so far is the possibility of a corner solution: an agent maximizes her utility at Q_1, if there is no point of tangency between the agent's indifference curve and her budget constraint. The higher the tax rate, t, for example, the flatter is the budget constraint Q_1R_1 and the higher is the probability of a corner solution. Similarly, individuals with relatively steep indifference curves may maximize their utility at

zero hours of work even in the absence of high tax rates. Another possible reason for a corner solution is a sufficiently large income effect induced by a basic income.

However, if we compare the incentive effects of the traditional, means-tested, welfare system to the possible impact of a BIFT scheme, the advantage of the latter is that hours of work may decline, but labor supply is less likely to fall to zero.

Figure 3.7 shows the possible disincentive effects of a welfare program with an effective marginal tax rate of 100%, where an unemployed income of Y_u is guaranteed, and \$1 of benefits is withdrawn for \$1 earned up to point S_1. Thus, the new budget constraint is $Q_0Q_1S_1R_1$, with an effectively zero wage rate throughout the horizontal part of the budget constraint. An agent who maximized her utility at point $\bar{E}_1$ in absence of the welfare program would find it optimal to accept welfare, since she can attain a higher indifference curve, $\hat{I}_1$, by reducing hours of work to zero.

However, if an agent's indifference curve were sufficiently flat, it would pass above Q_1 and the individual would maximize utility at the steep part of the budget constraint, S_1R_1.

Possible incentive effects of both BIFT and conditional welfare schemes are shown in figure 3.8. The basic income, B, is equal to the nonemployed income, Y_u, of the conditional welfare scheme. Although both schemes guarantee equal levels of benefits for the nonemployed, a utility maximizing agent chooses $L_1^B > 0$ under a BIFT scheme and a corner solution with $L_1^C = 0$ in case of conditional welfare.

Some agents, on the other hand, who chose point E_1^C in figure 3.9 and supplied $L_1^C > 0$ hours of work under a conditional welfare scheme rather than receiving benefits, would reduce labor supply and work $L_1^B < L_1^C$ hours in case of unconditional security. Therefore, the average labor supply response is in principle ambiguous in sign: it depends on the tax rates agents face in the respective schemes. Whether the positive effects of a lower marginal tax rate for agents currently on welfare are greater or smaller than the negative effects of agents facing lower marginal

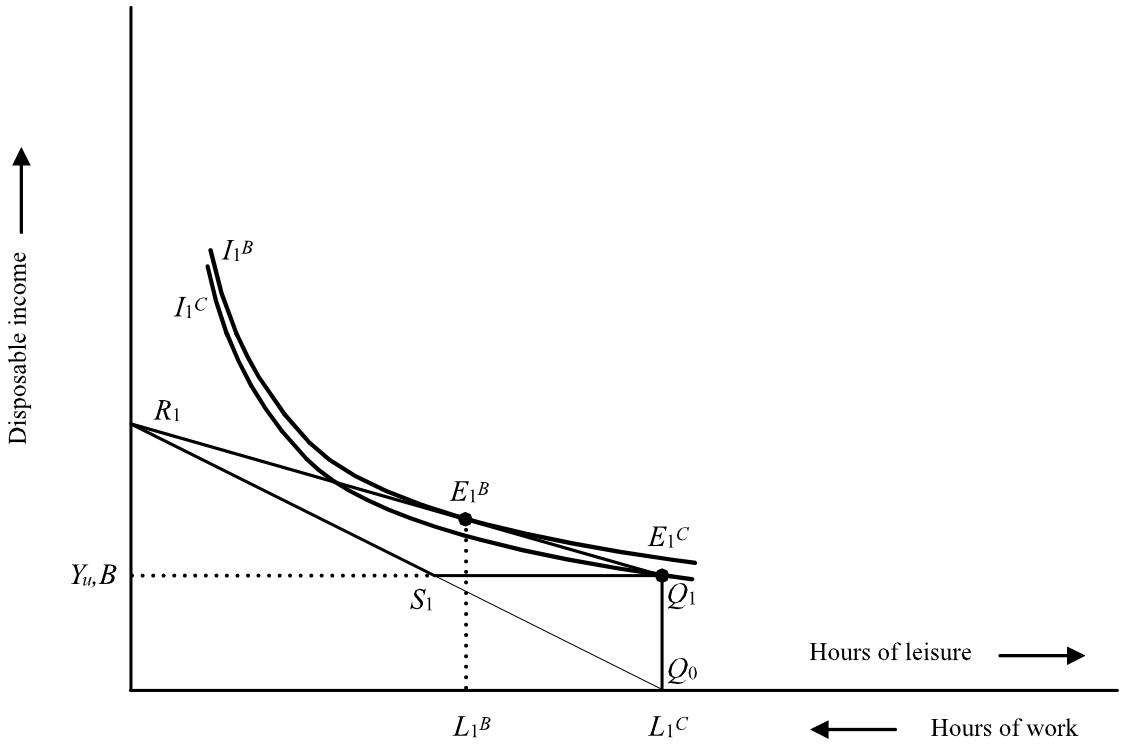


Figure 3.8: The Efficiency Advantage of a BIFT over Conditional Welfare

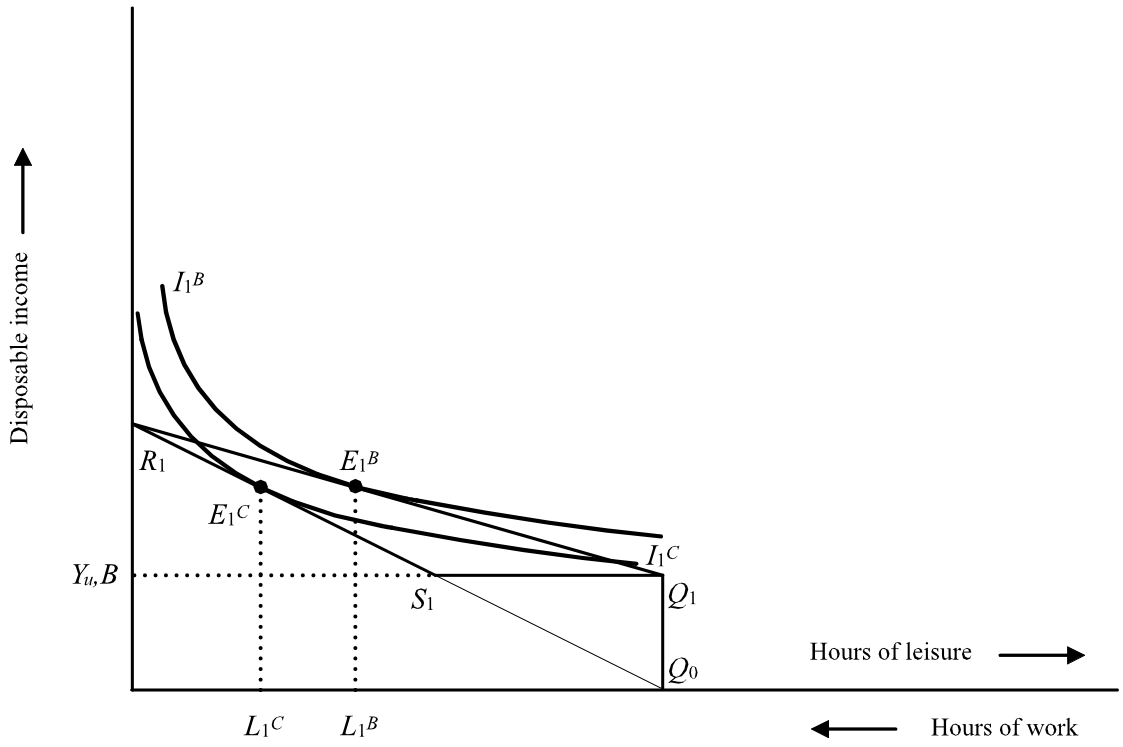


Figure 3.9: The Efficiency Disadvantage of a BIFT over Conditional Welfare

tax rates in a conditional scheme, will determine the direction of the change in aggregate labor supply.

The Average Tax Rate

The major difference between a simple proportional tax on earnings without benefits and a basic income financed by a proportional tax on earnings is the average tax rate an agent faces. For employed individuals in a proportional tax scheme, the marginal tax rate always equals the average tax rate, if we abstract from tax allowances. Given equal marginal tax rates in a BIFT scheme, workers face different average tax rates, which depend on the difference between taxes paid and benefits received. The average tax rate is defined as

$$t_a = 1 - \frac{Y_{i\tau}^D}{Y_{i\tau}}, , \qquad Y_{i\tau} > 0, \tag{3.3}$$

where $Y_{i\tau}^D$ is disposable income and $Y_{i\tau}$ is gross earnings. Disposable income in a BIFT scheme is

$$Y_{i\tau}^D = (1-t)\, Y_{i\tau} + B. \tag{3.4}$$

Substituting equation 3.4 for $Y_{i\tau}^D$ in equation 3.3 yields

$$t_a = t - \frac{B}{Y_{i\tau}}. \tag{3.5}$$

Figure 3.10 shows average tax rates for given marginal tax rates and the corresponding basic income for the simple economy with four agents and aggregated earnings of \$800 introduced in the previous chapter. Ignoring labor supply response, the basic income that can be afforded with a tax rate of 10% is \$20, and levying a tax of 50% sustains a basic income of \$100 per agent.

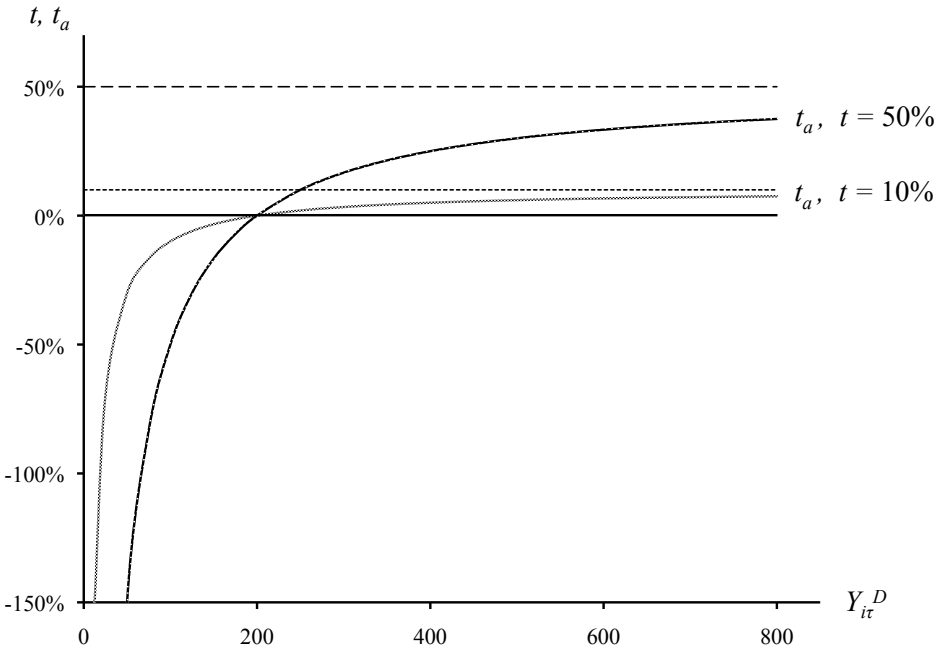


Figure 3.10: Effective Average and Marginal Tax Rates for a BIFT Scheme

A Taxation-Cum Labor Supply Function

With all ingredients defined, we can calculate the labor supply response to a change in marginal and average tax rates. I adapt the labor supply function discussed in Browning and Johnson (1984, p187), which is capable of capturing both income and substitution effects simultaneously:

$$Y_{i1} = (1 - t^{\gamma})\,(1 + \delta t_a)\,Y_{i0}, \qquad \gamma > 0, \delta \geq 0, \tag{3.6}$$

Y_{i1} is labor supply in terms of gross income, Y_{i0} is labor supply in terms of gross income in absence of taxes, t is the marginal tax rate and t_a is the average tax rate. γ is related to the substitution effect and δ captures the income effect. The smaller the value of γ, the greater is the labor supply response due to changes in the marginal tax rate. The higher the value of δ, the more labor supply rises due to an increase in the average tax rate. With $\gamma = \infty$ and $\delta = 0$ there is no labor supply response, hence $Y_{i1} = Y_{i0}$.

The labor supply function implies that labor supply elasticities depend on the values of the parameters γ and δ and the level of marginal and average tax rates. Since tax rates across agents differ with gross earnings and benefits received, a different set of compensated and uncompensated wage elasticities can be calculated for each individual worker. Compensated wage elasticities can be obtained by changing the marginal tax rate while keeping the average tax rate fixed. Uncompensated wage elasticities are calculated by simultaneously changing both marginal and average tax rates by the same amount.

The values of the parameters γ and δ Browning and Johnson believe to be most plausible are $\gamma = 3.25$ and $\delta = .2$. Applied to 1975 US household data, average compensated and uncompensated elasticities of .312 and .204 are obtained.[67] Using the benchmark parameters with Austrian EU-SILC microdata from 2004 yields average compensated and uncompensated wage elasticities of .314 and .267.[68]

Table 3.1 shows labor supply response for different combinations of marginal and effective average tax rates given the benchmark parameters $\gamma = 3.25$ and $\delta = .2$. Plotting the diagonal from $t = t_a = 0$ to $t = t_a = 1$ yields an uncompensated labor supply curve.

Uncompensated labor supply curves for different values of the income and substitution parameters are shown in figure 3.11. The solid curve depicts labor supply response given the benchmark parameters $\gamma = 3.25$ and $\delta = .2$. A stronger response to a change in marginal tax rates, hence a larger substitution effect, is shown by the thick dashed curve with $\gamma = 2.5$ and $\delta = .2$. The thin dashed curve is a labor supply function completely unresponsive to changes in the effective average tax rate with δ set to zero.

Applying the benchmark parameters shows that for tax rates from 0 to about 30% the income effect clearly dominates and labor supply rises relative to the no tax case. This behavior is compatible with backward bending labor supply functions,

[67] See Browning and Johnson (1984).
[68] See chapter 4 for details.

Table 3.1: Labor Supply After Taxes and Transfers Relative to Labor Supply Without Taxes and Transfers, $\gamma = 3.25$ $\delta = .2$

t \ t_a	-1.0	-.9	-.8	-.7	-.6	-.5	-.4	-.3	-.2	-.1	0	.1	.2	.3	.4	.5	.6	.7	.8	.9	1.0
0	.800	.820	.840	.860	.880	.900	.920	.940	.960	.980	1.000	1.020	1.040	1.060	1.080	1.100	1.120	1.140	1.160	1.180	1.200
.1	.800	.820	.840	.860	.880	.899	.919	.939	.959	.979	.999	1.019	1.039	1.059	1.079	1.099	1.119	1.139	1.159	1.179	1.199
.2	.796	.816	.836	.855	.875	.895	.915	.935	.955	.975	.995	1.015	1.034	1.054	1.074	1.094	1.114	1.134	1.154	1.174	1.194
.3	.784	.804	.823	.843	.862	.882	.902	.921	.941	.960	.980	1.000	1.019	1.039	1.058	1.078	1.098	1.117	1.137	1.156	1.176
.4	.759	.778	.797	.816	.835	.854	.873	.892	.911	.930	.949	.968	.987	1.006	1.025	1.044	1.063	1.082	1.101	1.120	1.139
.5	.716	.734	.752	.770	.788	.805	.823	.841	.859	.877	.895	.913	.931	.949	.966	.984	1.002	1.020	1.038	1.056	1.074
.6	.648	.664	.680	.697	.713	.729	.745	.761	.778	.794	.810	.826	.842	.858	.875	.891	.907	.923	.939	.956	.972
.7	.549	.563	.576	.590	.604	.618	.631	.645	.659	.673	.686	.700	.714	.727	.741	.755	.769	.782	.796	.810	.824
.8	.413	.423	.433	.444	.454	.464	.475	.485	.495	.505	.516	.526	.536	.547	.557	.567	.578	.588	.598	.609	.619
.9	.232	.238	.244	.249	.255	.261	.267	.273	.278	.284	.290	.296	.302	.307	.313	.319	.325	.331	.336	.342	.348
1.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

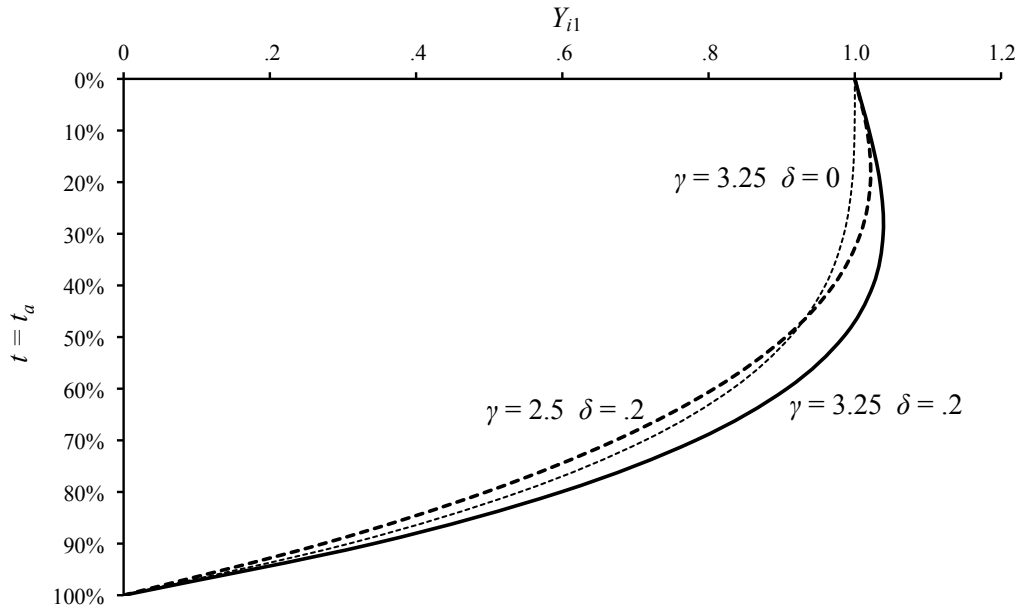


Figure 3.11: Labor Supply Functions with Proportional Income Tax

where the substitution effect dominates for lower wage rates and where the income effect dominates for higher wage rates. Thus, the labor supply curve is positively sloped for lower wage rates and negatively sloped or backward bending for higher wage rates. The widely used constant elasticity labor supply functions are not capable of modeling such a behavior.

The characteristics of the Browning and Johnson labor supply function make it an ideal choice for simulating the labor supply effects of different tax/benefit schemes. The following numerical example of labor supply effects of a basic income flat tax scheme relative to the no-tax case once more assumes a hypothetical four agent economy. The following chapter, *Empirics*, provides a simulation based on Austrian microdata from 2004 and compares labor supply effects and equity considerations of a basic income flat tax scheme to the existing conditional welfare state's with graduated tax rates.

Labor Supply Effects of a BIFT Policy: A Numerical Illustration

It turns out to be convenient to substitute the average tax rate, t_a, in equation 3.6 with

$$t_a = t - \frac{B}{Y_{i0}}. \tag{3.7}$$

After rearranging, the labor supply function reads

$$Y_{i1} = (1 - t^{\gamma}) \left[(1 + \delta t) Y_{i0} - \delta B \right]. \tag{3.8}$$

Taxes and benefits are subject to a balanced budget requirement. Remember that the dividend from the shares of natural resources, hence the basic income, B, is defined endogenously as the tax rate times per capita aggregated individual gross earnings, $\frac{1}{N} t \sum_{i=1}^{N} Y_i$. Therefore, changes in aggregated earnings due to changes of agents' behavior affect the level of a basic income. We can modify equation 3.8 to meet the requirement of a balanced budget basic income:

$$Y_{i\tau} = (1 - t^{\gamma}) \left[(1 + \delta t) Y_{i0} - \delta t \frac{1}{N} \sum_{i=1}^{N} Y_{i\tau-1} \right], \qquad Y_{i\tau} \geq 0. \tag{3.9}$$

The first term in equation 3.8 represents the 'negative' substitution effect. The higher the tax rate, t, the lower is the opportunity cost of leisure and labor supply decreases. The income effect is expressed by the terms in square brackets. The first term in brackets captures the 'positive' income effect as observed for proportional tax rates without benefits. The higher the tax rate, t, the more labor supply increases in order to compensate for the income lost because of the tax. Finally, the second term in brackets is the 'negative' income effect of an increase in the level of basic income. It works in the opposite direction, since the basic income makes an agent wealthier, which leads to a decrease in labor supply.

Because the level of the basic income depends on aggregate earnings and aggre-

gate earnings partially depend on the level of the basic income, several iterations are necessary to approximately satisfy the balanced budget requirement. Agents adjust their individual labor supply according to the tax rate and the level of the basic income and this adjustment alters per capita aggregated earnings and subsequently the level of the basic income. The change in the level of the basic income induces further adjustment in labor supply and alters the level of the basic income again.

Table 3.2: A Simulation of Labor Supply Effects, $\gamma = 3.25$ $\delta = .2$

	t	Busy	Able	Disable	Idle	Aggregate income	Basic income
$Y_{i\tau}$	0%	\$200	500	100	0	800	0
$Y_{i\tau}{}^{D}$		200	500	100	0		
$Y_{i\tau}$	10%	199.87	505.70	97.93	0	803.50	20.09
$Y_{i\tau}{}^{D}$		199.97	475.22	108.22	20.09		
$Y_{i\tau}$	50%	180.37	475.68	81.93	0	737.97	92.25
$Y_{i\tau}{}^{D}$		182.43	330.09	133.21	92.25		

The outcome of a numerical example of labor supply effects applied to the four agent economy is shown in table 3.2. Levying a 10 percent income tax leads to an overall increase in economic efficiency in terms of aggregate earnings. This is not surprising, since the taxation-cum labor supply function implies the dominance of the 'positive' income effect over the 'negative' substitution effect for sufficiently low tax rates. However, the level of the basic income simultaneously increases with the tax rate, which strengthens the 'negative' income effect related to income from other sources than labor. In fact, Able is the only individual to increase labor supply. Because of Able's relatively high gross income, the level of the basic income sustainable from a 10 percent tax is not sufficiently high to offset the income lost

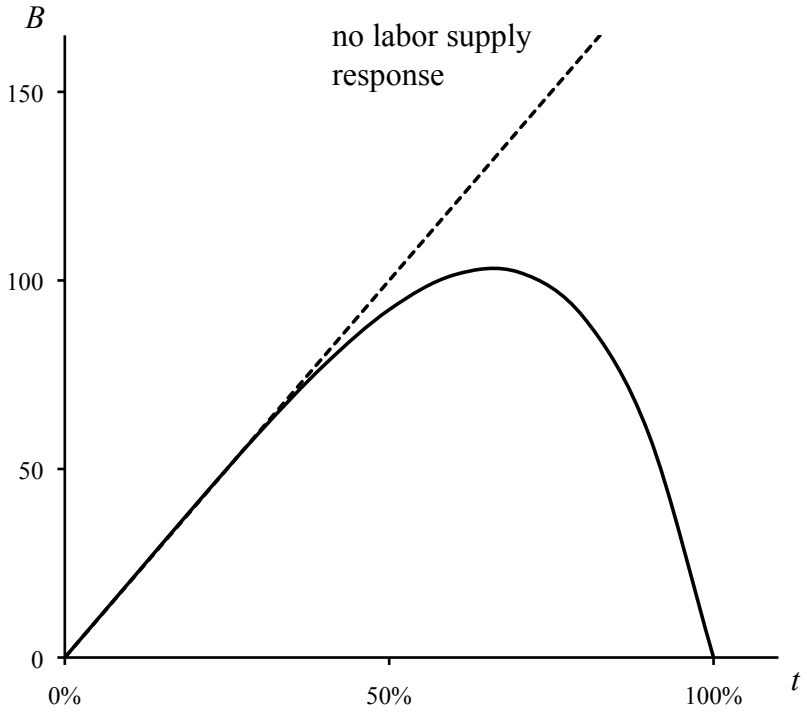


Figure 3.12: Sustainable Basic Income with and without Labor Supply Response with $\gamma = 3.25$ and $\delta = .2$

because of the tax. A tax rate of 50 percent, on the other hand, induces a fall in each agent's individual labor supply and aggregate earnings. The inequality in disposable income, however, has been reduced. This is the tradeoff between equality and efficiency.

Figure 3.12 shows a Laffer curve plotting the sustainable basic income for a range of tax rates from 0 to 100 percent. The dashed line is basic income in absence of a labor supply response. In the hypothetical economy, the maximum level of basic income that can be achieved is sustained by a tax rate between 60 and 70 percent.

Table 3.3: Losses Relative to Gains and Absolute Changes in Disposable Income

			Change in income				
γ	δ	t	Busy	Able	Disable	Idle	Losses/Gains
		10%	$ -0.03	-24.78	8.22	20.09	.88
		20%	-0.71	-52.44	16.54	40.18	.94
		30%	-3.06	-84.91	24.22	59.70	1.05
		40%	-8.25	-123.74	30.25	77.58	1.22
3.25	.2	50%	-17.57	-169.91	33.21	92.25	1.49
		60%	-32.55	-223.70	31.16	101.45	1.93
		70%	-55.10	-284.69	21.43	102.17	2.75
		80%	-87.78	-351.88	0.26	90.15	4.86
		90%	-134.24	-423.97	-37.66	59.27	10.05
		10%	-0.54	-26.01	7.95	20.04	.95
		20%	-3.13	-57.99	15.16	39.69	1.11
		30%	-8.65	-97.02	20.81	57.98	1.34
		40%	-17.78	-143.05	23.98	73.68	1.65
2.5	.2	50%	-31.18	-195.35	23.54	85.29	2.08
		60%	-49.62	-252.70	18.07	91.01	2.77
		70%	-74.10	-313.57	5.72	88.68	4.11
		80%	-105.97	-376.21	-15.89	75.48	8.09
		90%	-147.06	-438.86	-49.79	47.69	13.33
		10%	-0.11	-30.26	9.94	19.99	1.02
		20%	-1.07	-62.35	19.36	39.79	1.07
		30%	-4.00	-98.19	27.40	58.80	1.19
		40%	-10.18	-139.34	32.87	75.93	1.37
3.25	0	50%	-21.02	-186.79	34.23	89.49	1.68
		60%	-38.02	-240.83	29.58	97.19	2.20
		70%	-62.75	-300.98	16.66	96.08	3.23
		80%	-96.84	-365.90	-7.16	82.52	6.14
		90%	-142.01	-433.31	-44.91	52.19	11.88

The Leaky Bucket

Arthur Okun coined the expression 'the leaky bucket' as a metaphor for the equity-efficiency tradeoff caused by the redistribution of income.[69] If only a fraction of income lost by high income earners is redistributed to low income earners, the bucket is leaky. We learn from the 50% tax rate scenario from table 3.2, for example, that Able's and Busy's losses in disposable income are one and a half times larger than Disable's and Idle's gains. Table 3.3 gives an overview of the changes in disposable income at various tax rates. The losses to gains ratio in the last column is a measure of the equity-efficiency tradeoff. A losses to gains ratio of 1 would imply that there is no efficiency cost caused by redistribution. A value less than 1 is an efficiency improvement in terms of income. A value of the losses to gains ratio greater than 1, on the other hand, implies an efficiency cost on the way towards greater equality. A tax rate of 70 percent ($\gamma = 3.25$ and $\delta = .2$) yields a losses to gains ratio of 2.75. This means that \$1 redistributed to the gainers costs the losers \$2.75.

The Welfare Tradeoff

In public debate, the efficiency cost caused by redistribution is usually used synonymously with the reduction in aggregate earnings, or more precisely, the reduction in GDP.[70] The previous analysis of labor supply effects of a BIFT scheme implicitly adopted this view.

Welfare economics, however, measures the efficiency cost in terms of the reduction in well-being. The difference to the efficiency cost in terms of income loss is that the *welfare cost* only accounts for the compensated change in labor supply associated with the substitution effect.[71] Thus, the welfare economics approach considers the utility gain from an increase in hours of leisure.

[69] See Okun (1975).
[70] Atkinson (1995), p41.
[71] Browning and Johnson (1984), p198.

Figure 3.13 illustrates both the welfare cost and the efficiency cost in terms of income loss for an agent who is a net tax payer. The level of the basic income and the tax rate are equal to the parameters used in figure 3.6. The net tax revenue E_0G can be identified by drawing a line through the after tax/benefit point E_1, parallel to the no tax budget constraint Q_0R_0. As analyzed above, the move from point $\hat{E}_1$ to E_1 is the compensated change in labor supply associated with the substitution effect. The distance FD equals the efficiency cost in terms of income due to the compensated change in labor supply. $\hat{E}_1D$ is the agent's appraisal of the extra hours of leisure associated with the move from $\hat{E}_1$ to E_1. Therefore, the welfare cost is the difference between FD and $\hat{E}_1D$. Subsequently, the welfare cost of the introduction of a BIFT scheme equals $F\hat{E}_1$. As expected, the welfare cost is less than the efficiency cost in terms of income, E_0C. Thus, the losses to gains ratios will be smaller compared to the values yielded by the efficiency cost approach in terms of income.

The Value of Leisure

Computing an agent's income equivalent appraisal of leisure is straightforward. Using equation 3.8 and considering only the income effect yields

$$Y_{i\tau}^{inc} = \left[(1+\delta t)\, Y_{i0} - \delta t \frac{1}{N} \sum_{i=1}^{N} Y_{i\tau-1} \right], \qquad Y_{i\tau}^{inc} \geq 0. \tag{3.10}$$

Calculating disposable income in absence of the substitution effect,

$$Y_{i\tau}^{Dinc} = (1-t)\, Y_{i\tau}^{inc} + \frac{1}{N} t \sum_{i=1}^{N} Y_{i\tau}, \tag{3.11}$$

and subtracting disposable income $Y_{i\tau}^{D}$ yields the value agent i attaches to leisure, which is equal to the distance $\hat{E}_1D$ in figure 3.13:

$$V_{i\tau}^{T} = Y_{i\tau}^{Dinc} - Y_{i\tau}^{D}. \tag{3.12}$$

Computing the welfare cost, $F\hat{E}_1$, requires to have information on either the wage

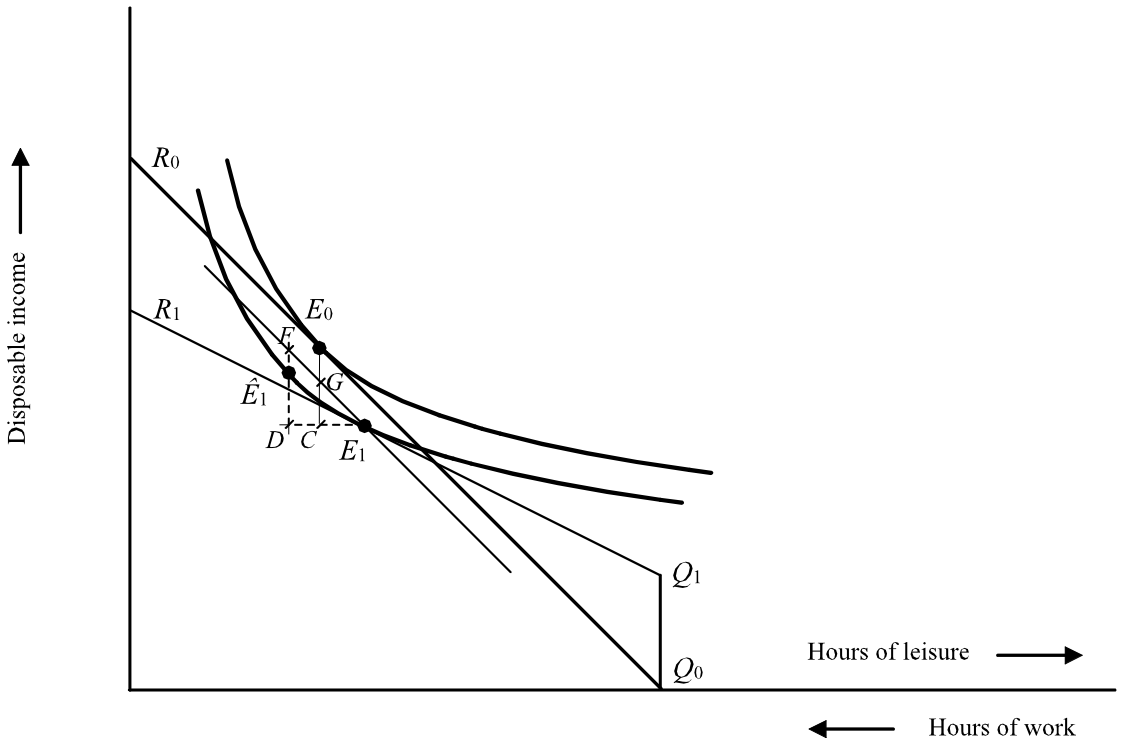


Figure 3.13: The Welfare Tradeoff

Table 3.4: Losses Relative to Gains and Absolute Total Changes

			Total change				
γ	δ	t	Busy	Able	Disable	Idle	Losses/Gains
		10%	$0.07	-24.53	8.27	20.09	.86
		20%	0.15	-50.25	16.95	40.18	.88
		30%	-0.26	-77.66	25.54	59.70	.91
		40%	-2.13	-107.73	33.07	77.58	.99
3.25	.2	50%	-6.98	-141.98	38.02	92.25	1.14
		60%	-17.06	-182.66	38.14	101.45	1.43
		70%	-35.56	-232.96	30.24	102.17	2.03
		80%	-67.06	-297.46	9.74	90.15	3.65
		90%	-118.32	-382.92	-30.12	59.27	8.97
		10%	0.03	-24.57	8.23	20.04	.87
		20%	-0.26	-50.66	16.54	39.69	.91
		30%	-1.73	-79.13	24.07	57.98	.99
		40%	-5.56	-111.16	29.64	73.68	1.13
2.5	.2	50%	-13.24	-148.24	31.76	85.29	1.38
		60%	-26.67	-192.27	28.53	91.01	1.83
		70%	-48.24	-245.64	17.56	88.68	2.77
		80%	-81.14	-311.54	-4.34	75.48	5.52
		90%	-129.66	-394.26	-41.46	47.69	11.85
		10%	-0.01	-30.01	9.99	19.99	1.00
		20%	-0.21	-60.21	19.79	39.79	1.01
		30%	-1.20	-91.20	28.80	58.80	1.05
		40%	-4.07	-124.07	35.93	75.93	1.15
3.25	0	50%	-10.51	-160.51	39.49	89.49	1.33
		60%	-22.81	-202.81	37.19	97.19	1.68
		70%	-43.92	-253.92	26.08	96.08	2.44
		80%	-77.48	-317.48	2.52	82.52	6.14
		90%	-127.81	-397.81	-37.81	52.19	10.80

rate or hours supplied in Y_{i0}. The change in hours worked from $\hat{E}_1$ to E_1 times the market wage rate is the compensated change in gross earnings, FD. Subtracting the value of leisure, $V_{i\tau}^T$, yields an agent's individual welfare cost.

Table 3.4 shows total gains and losses for each agent i. Income equivalent changes are calculated by imputing the value of leisure to the changes in disposable income. The total loss is equal to the income loss E_0C minus the value of leisure $\hat{E}_1D$.

3.3 The Labor Market

The purpose of this section is to develop a richer model of the labor market, capable of explaining causes of inefficiencies that can't be addressed by an analysis of the supply side alone. The following pages are dedicated to analyzing the implications of involuntary unemployment caused by wages set above the market clearing wage. I am going to show that a BIFT policy is in principle capable of reducing involuntary unemployment without worsening efficiency in terms of income.

While the previous section was concerned with *voluntary* changes in labor supply due to changes in the tax/benefit system, efficiency wage models are capable of explaining *involuntary* unemployment as a result of non-Walrasian features of the labor market. A useful efficiency model that permits us to analyze some important labor market implications of a basic income scheme is the Shapiro Stiglitz model.

Equilibrium Unemployment

In a conventional Arrow-Debreu economy, where there is full employment, each agent receives the competitive market wage, and given imperfect monitoring, the incentive for workers to shirk is high. A shirking employee is not penalized, since she is immediately rehired by a different employer at the going market wage.

The Shapiro Stiglitz shirking model assumes that in situations where monitoring is either costly or impractical, employers pay a wage above the market clearing wage to assure that employees' incentive to shirk is minimized.[72] The efficiency wages paid by employers induce labor demand to fall relative to the competitive equilibrium case and involuntary unemployment results. It is the very presence of "equilibrium unemployment [that acts] as a worker discipline device".[73] Thus, if a worker is fired because of shirking, she will not be rehired immediately. What is crucial for setting efficiency wages is the unemployment rate and the level of unemployment assistance.

Equilibrium Unemployment and Locke's Proviso

Although the previous analysis of labor supply didn't distinguish between employed and self-employed agents, it was implicitly assumed that agents were self-employed producers (producer society), being free in their choice of hours of work. The labor market model that is going to be developed below, analyzes a job society, where production is organized through employment relations. In a job society, some otherwise identical individuals have a job and some are involuntarily unemployed.

Therefore, jobs can be considered assets on par with external endowments.[74] In analogy to the discussion of the distribution of external endowments, Locke's proviso can be applied to employment. 'Enough and as good left in common for others', assuming identical individuals, and 'enough left in common for others', assuming heterogeneous individuals, acts as a moral constraint against involuntary unemployment, given full employment in the absence of efficiency wages.

Consequently, the employment rent yielded by the premium paid above the market clearing wage is to be distributed among all agents, employed and voluntarily or involuntarily unemployed, in form of an unconditional basic income.

[72] See Shapiro and Stiglitz in Akerlof and Yellen (1986), p45.
[73] Shapiro and Stiglitz in Akerlof and Yellen (1986), p45.
[74] Van Parijs (1995), p108.

The following analysis is going to highlight the mechanisms leading to equilibrium unemployment, employment rents and the effects of an unconditional basic income on labor force participation and employment.

Assumptions

The economy consists of a large number of infinitely lived identical workers N and a large number of identical firms M. Labor is indivisible, thus the number of hours employees work can't vary.

A risk neutral employee's instantaneous utility function is

$$U_w = Y_w\,(1-t) - e, \qquad e = \begin{cases} 0 & \text{if no effort is exerted,} \\ e^*, e^* > 0, & \text{if effort is exerted,} \end{cases} \tag{3.13}$$

with Y_w being the agent's gross wage income, t ($0 \leq t < 1$) is a single proportional tax rate without tax allowances and e is a worker's level of effort at the job. e can take only two states: e is either equal to zero or some positive fixed level e^* of effort is exerted. At any point in time workers are either employed (denoted uppercase E) and are exerting effort (denoted lowercase N for nonshirkers), or are employed and are not exerting effort (denoted lowercase S for shirkers), or workers are unemployed (denoted uppercase U). The expected lifetime utilities of employed shirkers, employed nonshirkers and unemployed agents are denoted V_S^E, V_N^E and V^U, respectively.

The transition between the three states depends on three probability parameters. The hazard rate for job brakeup or layoff rate b ($b > 0$) is the probability per unit time of getting fired due to exogenously given reasons such as reorganizations, the detection rate q is the probability per unit time of getting caught shirking and the job acquisition rate a is the probability per unit time of finding employment.

Unemployed workers are eligible for unemployment and social assistance Y_u. The

latter works like a wage for all involuntary unemployed individuals.

A representative firm's profit function is

$$\pi = A(e^*L)^\beta - Y_w(L+S), \qquad 0 < \beta < 1, \tag{3.14}$$

where $A(e^*L)^\beta$ is the firm's production function. I am assuming Cobb-Douglas production functions with technology parameter A and labor's share β, capital is assumed to be fixed. L workers employed are exerting effort at level e^* and S workers employed are shirking.

I further assume that in the absence of imperfect monitoring ($q \to \infty$) the labor market is of Arrow-Debreu type with full market clearing and full employment.

The Aggregate Nonshirking Condition with Unemployment Assistance

The expected lifetime utility of a shirker is

$$V_S^E = \frac{Y_w\,(1-t) - (b+q)\left(V_S^E - V^U\right)}{r} \tag{3.15}$$

and the expected lifetime utility of a nonshirker is

$$V_N^E = \frac{Y_w\,(1-t) - e^* - b\left(V_N^E - V^U\right)}{r}. \tag{3.16}$$

Expected utilities are discounted by the interest rate r ($r > 0$). Thinking of jobs as assets, the numerators represent a worker's dividend and expected capital losses per unit time. An employed nonshirker receives a dividend of $Y_w(1-t) - e^*$ per unit time and faces an expected capital loss of $V_S^E - V^U$ with a probability of b per unit time. If the employee is shirking, she receives a dividend of $Y_w(1-t)$ per unit time and faces an expected capital loss of $(b+q)(V_S^E - V^U)$.

An employee chooses not to shirk if the expected lifetime utility of nonshirking is greater than the expected lifetime utility of shirking, hence the nonshirking condition reads

$$V_N^E \geq V_S^E. \tag{3.17}$$

The assumption that either no effort or some positive, fixed level of effort e^* that can't be exceeded, is exerted, implies that firms choose

$$V_N^E = V_S^E. \tag{3.18}$$

Inserting equations 3.15 and 3.16 and solving for disposable wage income yields

$$Y_w\,(1-t) = rV^U + (b+r+q)\frac{e^*}{q}. \tag{3.19}$$

To prevent shirking, an employee's gross wage income has to increase with the tax rate t, the interest rate and the expected utility of being unemployed, the layoff rate b and the employee's level of effort at work. Gross wage income and the probability of getting caught shirking are inversely related - the lower the latter, the higher the wage. Expected utility of being unemployed is defined as

$$V^U = \frac{Y_u + a\left(V^E - V^U\right)}{r}, \tag{3.20}$$

where Y_u is unemployment assistance, a is the job acquisition rate and V^E equals V_N^E in equilibrium. The dividend from being unemployed is Y_u per unit time and the expected capital gain is $a(V^E - V^U)$ per unit time. Solving equations 3.16 and 3.20 simultaneously for disposable wage income yields the aggregate nonshirking condition

$$Y_w\,(1-t) = Y_u + e^* + \frac{e^*}{q}\,(a+b+r)\,. \tag{3.21}$$

Gross wage income positively depends on the tax rate t, the unemployment assistance Y_u, the effort level e^* and the term in brackets: acquisition rate a, layoff rate b and interest rate r. Gross wage income and detection rate q are negatively

related.

The Aggregate Nonshirking Condition with UBI

What, if anything, happens to efficiency wage setting under a UBI scheme? A major difference to unemployment assistance is that due to its unconditional nature, the basic income is paid irrespective of an agent's employment status. This feature is reflected by a risk neutral employee's instantaneous utility function with basic income B (everything else being equal to the preceeding analysis):

$$U_w^B = Y_w (1-t) - e + B. \tag{3.22}$$

Modifying the expected lifetime utilities for employed shirkers and nonshirkers and the unemployed is straightforward:

$$V_S^E = \frac{Y_w (1-t) + B - (b+q)\left(V_S^E - V^U\right)}{r}, \tag{3.23}$$

$$V_N^E = \frac{Y_w (1-t) + B - e^* - b\left(V_N^E - V^U\right)}{r}, \tag{3.24}$$

$$V^U = \frac{B + a\left(V^E - V^U\right)}{r}. \tag{3.25}$$

Solving equations 3.23 and 3.24 simultaneously for disposable wage income yields the aggregate nonshirking condition under a basic income flat tax scheme:

$$Y_w (1-t) = e^* + \frac{e^*}{q}(a+b+r). \tag{3.26}$$

Note that the basic income B is not present in the modified aggregate non-shirking condition. B is neutral to the wage setting decision, because it equally increases the utilities of employed shirkers and nonshirkers and the unemployed.

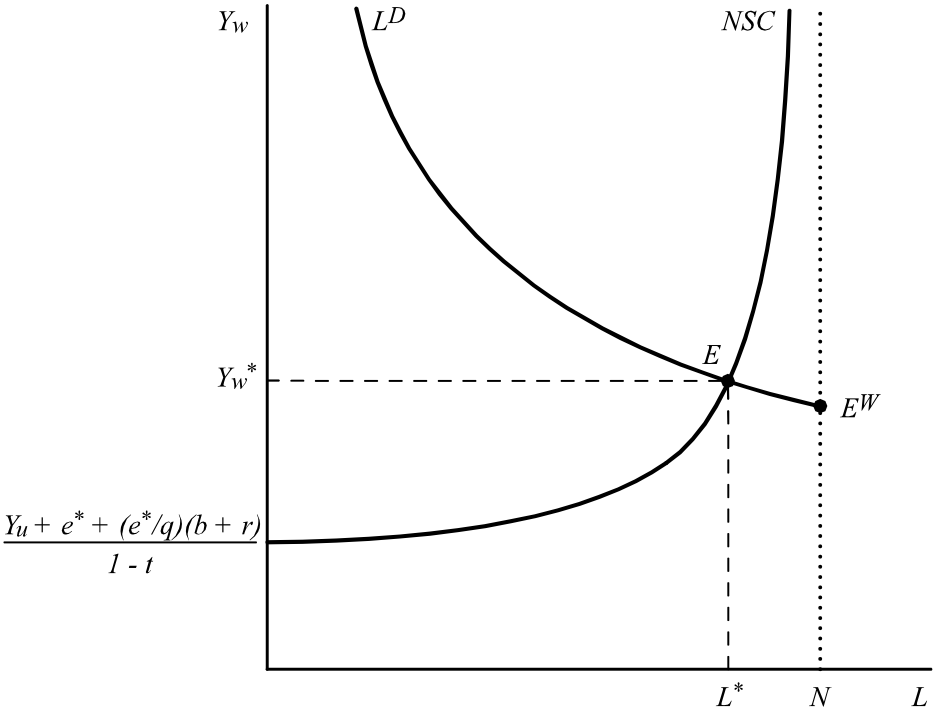


Figure 3.14: Labor Market Equilibrium

Labor Market Equilibrium

It is useful to express the efficiency wage income Y_w in terms of aggregate employment L. The acquisition rate a can be related to employment: in steady-state, the flow into unemployment, bL, is equal to the flow into employment, $a(N - L)$, hence

$$a = \frac{bN}{N - L}, \tag{3.27}$$

where N is total labor supply. Substituting for the acquisition rate a in the aggregate nonshirking condition (3.21) and rearranging yields the effort exerting wage

$$Y_w = \left[Y_u + e^* + \frac{e^*}{q} \left(\frac{bN}{N - L} + r \right) \right] \frac{1}{1 - t}. \tag{3.28}$$

Firms take the wage required for nonshirking as given and maximize profits

$$\pi = A(e^*L)^\beta - Y_w L, \qquad 0 < \beta < 1, \tag{3.29}$$

yielding the following first order condition:

$$\frac{\partial \pi}{\partial L} = 0 \rightarrow L^D = \frac{1}{e^*}\left(\frac{Y_w}{Ae^*\beta}\right)^{\frac{1}{\beta-1}}. \tag{3.30}$$

The market is in equilibrium at the intersection of the aggregate labor demand curve, L^D, (3.30) and the aggregate nonshirking condition, NSC, (3.28):

$$Y_w^* = \frac{A(e^*L)^\beta \beta}{L} = \left[Y_u + e^* + \frac{e^*}{q}\left(\frac{bN}{N-L} + r\right)\right]\frac{1}{1-t}. \tag{3.31}$$

Figure 3.14 shows the labor market equilibrium, E, in LY_w space. The Walrasian equlibrium with full market clearing and full employment is denoted E^W. *Equilibrium unemployment* equals $N - L^*$. Note that from the employees' point of view, unemployment is *involuntary*. Unemployed workers strictly prefer to be employed but cannot bid the wage down since firms know that a lower wage would induce shirking.

The effects of a UBI policy are shown in figure 3.15. Ceteris paribus, an unconditional basic income shifts the NSC down by the amount of unemployment assistance, Y_u. The equilibrium moves down the aggregate labor demand curve: both the equilibrium wage and the level of involuntary unemployment decrease. A similar effect can be observed for an increase in the detection rate, q, an increase in the layoff rate, b, and a fall of the tax rate, t.

Closing the Model

The ingredient needed to close the model is the Browning and Johnson labor supply function discussed above. Equation 3.6 can be modified to yield an aggregate taxation-cum labor supply function, reflecting the change in the number of workers,

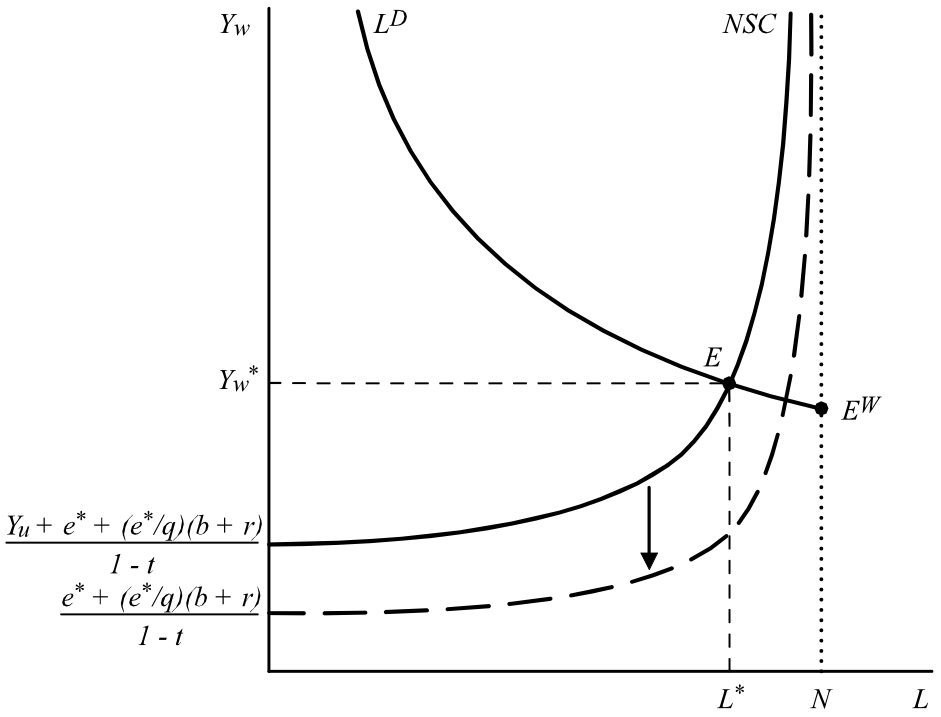


Figure 3.15: The Effects of an Abolishment of Unemployment Assistance Y_u

N, with respect to changes in the tax/benefit structure:

$$N = (1 - t^{\gamma})\,(1 + \delta t_a)\,N_0. \tag{3.32}$$

The average tax rate is substituted by

$$t_a = t - \frac{B}{Y_w}, \qquad Y_w > 0, \tag{3.33}$$

yielding an aggregate taxation-cum-UBI labor supply function

$$N = (1 - t^{\gamma}) \left[(1 + \delta t) - \delta \frac{B}{Y_w}\right] N_0. \tag{3.34}$$

For comparative statistics, it turns out to be convenient to substitute a parameter g ($g \geq 0$) for B/Y_w. Similarly, unemployment assistance, Y_u, is being tied to wage income, Y_w:

$$Y_u = kY_w, \qquad 0 \leq k < 1, Y_w > 0. \tag{3.35}$$

After rearranging, the model can be stated as:

$$Y_w^* = \frac{A\,(e^* L)^{\beta}\,\beta}{L} = \left[\frac{e^*\,(bN - (L - N)\,(q + r))}{q\,(L - N)\,(k - 1)}\right] \frac{1}{1 - t}, \tag{3.36}$$

$$k = 0 \text{ if } B > 0$$

and

$$N = (1 - t^{\gamma})\,[(1 + \delta t) - \delta g]\,N_0, \qquad g = 0 \text{ if } Y_u > 0. \tag{3.37}$$

Finally, the government budget constraints for the conditional social security scheme and the unconditional basic income scheme are

$$t^C Y_w^C L^C = Y_u \left[\left(N^C - L^C\right) + \mu N^C\right] \tag{3.38}$$

or

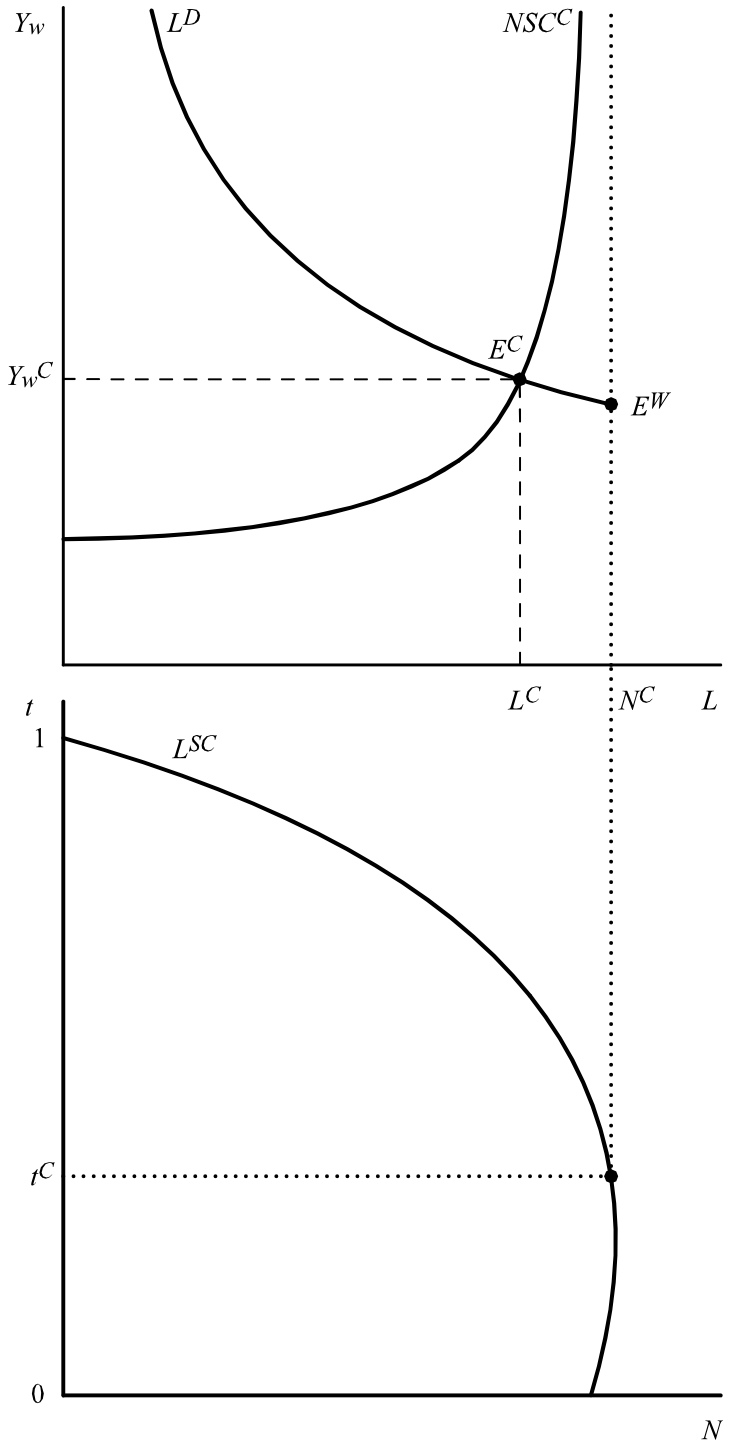


Figure 3.16: Taxation-Cum Labor Market Equilibrium

$$t^C L^C = k\left[\left(N^C - L^C\right) + \mu N^C\right], \tag{3.39}$$

and

$$t^B Y_w^B L^B = B\left[N^C + \mu N^C\right] \tag{3.40}$$

or

$$t^B L^B = g\left[N^C + \mu N^C\right]. \tag{3.41}$$

Conditional social security scheme parameters are denoted uppercase C and basic income scheme parameters are denoted uppercase B. μ $(0 < \mu < 1)$ is assumed to be the proportion of the total population with zero earning power, including retirees, children and the disabled.

From Involuntary to Voluntary Unemployment: A Numerical Illustration

In order to get an intuition for the magnitudes of the changes of various parameters of the model, a numerical example is useful. Since we want to obtain comparative statistics between conditional and unconditional social security schemes, the following values of parameters remain unchanged for both conditional security and unconditional basic income schemes:

$\beta = .5, A = 35, e^* = 1.0, b = .25, q = .25, r = .04, N^C = 1.0, Y_w^C = 1.0,$
$k = .45, \gamma = 3.25, \delta = .2, \mu = .33$ and $.44$,

where N^C and Y_w^C are normalized to one. Table 3.5 shows the impact of the two social security schemes on the tax rate (t^C, t^B), the size of the labor force (N^B), wage income (Y_w^B) and (un)employment $(L^B, L^C, N^C - L^C, N^B - L^B, N^C - N^B)$

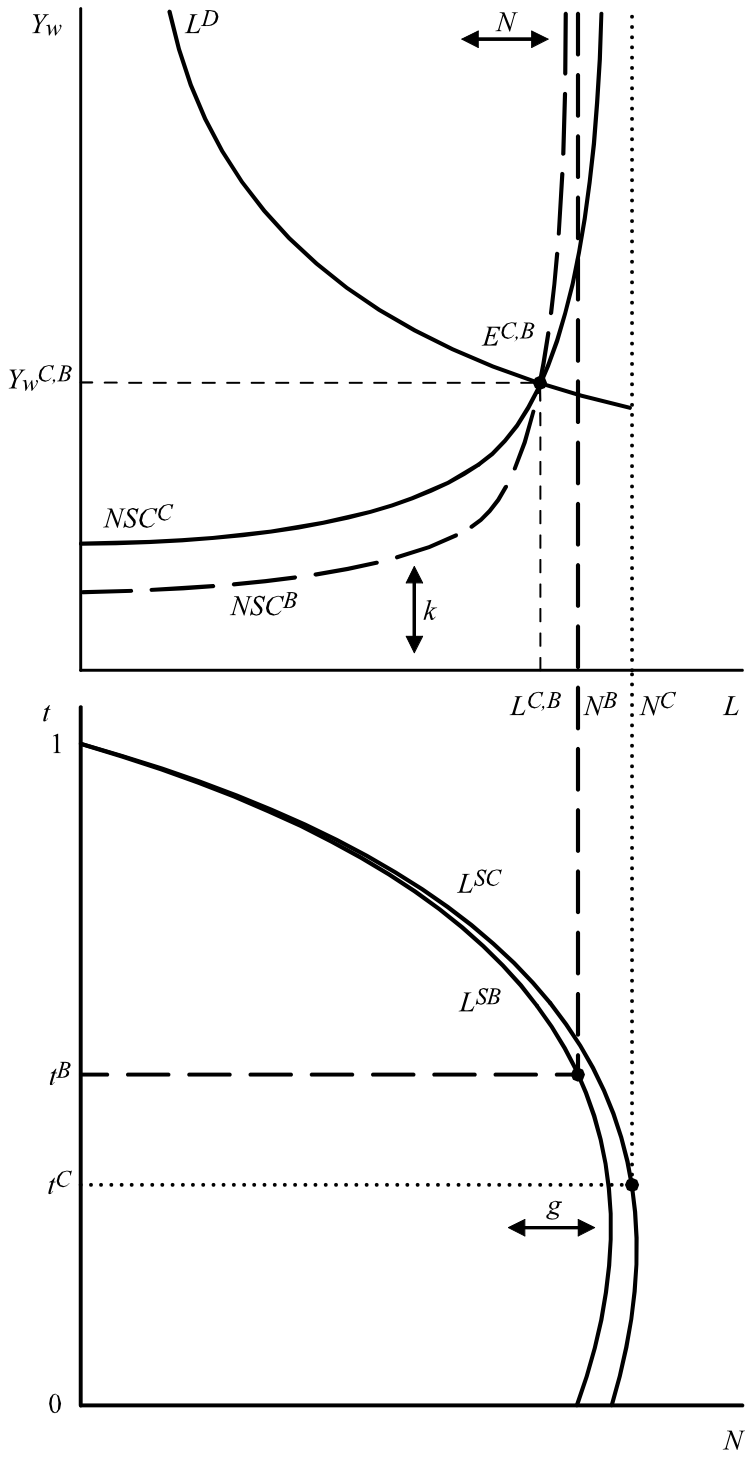


Figure 3.17: A Shift from Conditional to Unconditional Social Security, $L^C = L^B$

for different values of g.

Figure 3.17 depicts the mechanisms at work. In the conditional security scenario, the tax rate t^C alone sets the level of labor force participation, N^C, since marginal and effective average tax rates are equal. In the basic income scenario, this is not the case. The effective average tax rate differs from the marginal tax rate, t^B. This property is captured by the level of the basic income to wage ratio, g. The higher the value of g, the lower the effective average tax rate and the further the L^{SB} curve shifts to the left. Thus, given equal tax rates ($t^B = t^C$), labor force participation, N^B, decreases relative to the conditional scheme's, N^C.

In the upper half of figure 3.17, $k = 0$ shifts the NSC^B curve down. Similarly, the decrease in labor force participation shifts the NSC^B curve to the left. In the special case considered, employment (L^C, L^B) and the corresponding wage are left unchanged. Thus, involuntary unemployment falls from $N^C - L^{C,B}$ to $N^B - L^{C,B}$.

In the numerical example with $\mu = .33$, $L^C = L^B$ occurs at $g = .25$. Involuntary unemployment falls from $N^C - L^C = .15$ to $N^B - L^B = .09$. The reduction of the labor force by $N^C - N^B = .06$ can be considered a shift from involuntary to voluntary unemployment. The tax rate required to finance the basic income is 39%. A rise in the dependent population to $\mu = .44$ requires higher tax rates for each level of g. The labor neutral case $L^C = L^B$ occurs for g values slightly above .25 and a respective tax rate of around 45%. For g values below the labor neutral case, employment rises, reducing both unemployment and the wage, but also the income of the unemployed.

3.4 The Bottom Line

At the beginning of this chapter we have learned that efficiency and equity considerations can't be addressed separately. The analysis concentrated on distributional and efficiency effects induced by changes of the tax/benefit structure. It could be shown that a basic income flat tax scheme is in theory capable of improving both

Table 3.5: From Conditional to Unconditional Social Security, $\gamma = 3.25, \delta = .2$

Conditional Social Security $\mu = .33$						
k	t^C	N^C	L^C	N^C-L^C		$Y_w{}^C$
.45	.25	1.0	.85	.15		1.0
Unconditional Basic Income $\mu = .33$						
g	t^B	N^B	L^B	N^B-L^B	N^C-N^B	$Y_w{}^B$
.15	.22	.97	.90	.07	.03	.978
.20	.30	.96	.88	.08	.04	.983
.25	.39	.94	.85	.09	.06	1.000
.27	.43	.93	.83	.10	.07	1.012
.29	.48	.90	.80	.10	.10	1.024
.31	.55	.86	.75	.11	.14	1.056
Conditional Social Security $\mu = .44$						
k	t^C	N^C	L^C	N^C-L^C		$Y_w{}^C$
.45	.33	1.0	.83	.17		1.0
Unconditional Basic Income $\mu = .44$						
g	t^B	N^B	L^B	N^B-L^B	N^C-N^B	$Y_w{}^B$
.10	.16	.97	.90	.07	.03	.961
.15	.24	.97	.90	.08	.03	.963
.20	.33	.96	.88	.08	.04	.975
.25	.43	.93	.84	.10	.07	.996
.27	.48	.91	.81	.10	.09	1.015
.29	.56	.86	.75	.11	.14	1.058

Conditional social security scheme parameters are denoted uppercase C and basic income scheme parameters are denoted uppercase B. μ is the proportion of the total population with zero earning power. N^C and Y_w^C are normalized to one, $\beta = .5, A = 35, e^* = 1.0, b = .25, q = .25, r = .04$.

equality in income and overall economic efficiency, the latter in terms of welfare as well as in terms of income. Applying efficiency wage theory both extended the labor supply model to the demand side and reminded us that involuntary unemployment is a persistent feature of labor markets. An unconditional basic income, however, can be a means to reduce involuntary unemployment and while doing so improves or maintains economic efficiency compared to labor markets with conditional social security.

What has been left aside while focussing on behavior effects of taxes and benefits, is the notion of equality of opportunity. Equality of opportunity can both provide justice and improve efficiency. I conclude this chapter with the discussion of a market failure that is directly related to a lack of equality of opportunity, the misallocation of talent.

3.5 The (Mis)Allocation of Talent

In the previous chapter the terms talent and ability were used more or less synonymously. A discussion of educational issues, however, requires to make a distinction. Talent refers to inbred, genetically determined features of a person, while ability identifies a person's talent and her educational background. Staffolani and Valentini refer to the latter as "scholastic abilty".[75]

Assume an economy with perfect capital markets, where each agent can borrow against her expected lifetime income stream at the going interest rate. Assume further that the agent knows about her talents and uses the borrowed capital either for education, hence invests in acquiring ability, or uses the funds to become an entrepreneur. Given the two assumption, there would be not much to worry about from a neoclassical economist's point of view. Talented agents would improve their inborn abilities in order to maximize lifetime utility or could realize their ideas as entrepreneurs. Thus, each agent is the architect of her own fortune and we could

[75] Staffolani and Valentini (2006), p3.

stop the discussion at this point.

Unfortunately, both assumptions are keen abstractions from the way both the economy and individuals operate. Informational constraints, again, are the reasons for imperfect capital markets and the awareness for one's 'hidden' talents. Following Carneiro and Heckman, the positive correlation between family income and college attendance is due to two effects: short-run credit constraints (because of imperfect capital markets) and long-run family effects.[76]

Staffolani and Valentini find, using recent data from Italy, the UK and the US that the probability of gaining a skilled position positively depends on the skill level of an individual's parents.[77]

Upbringing: The Long-Run Family Effects

An individual brought up by entrepreneurial parents is more likely to attain the knowledge it needs to run a business than a blue collar worker's child. More generally, someone being brought up by highly educated parents is more likely to attain higher education than someone who's parents are less well educated. Contrary to short-run credit constraints this is not due to financial restrictions, it is due to a difference in families' social values, different expectations of a 'good life' and the skills parents pass on to their children.

The highly talented child of a blue collar worker would probably be a better entrepreneur than an entrepreneur's child if she had the chance of being raised by the latter. But since this is not happening and despite a lack of talent relative to the blue collar worker's child, the entrepreneur's child has a higher probability of becoming a good entrepreneur than the talented worker's child. Unlike imperfect capital markets, the misallocation of talent resulting from long-run family effects is no sign of a market failure, since "the people who become entrepreneur are the

[76] Carneira and Heckman (2002), p25.
[77] Staffolani and Valentini (2006), p22.

best entrepreneurs, but the world could have been better if the talented were the ones who got the information".[78]

Nevertheless, the resulting allocation is inefficient. A means to abolish the decoupling of talent and economic advantage is to discharge parents from raising their children and handing over the upbringing to society. Obviously, such a radical measure is not compatible with a libertarian society. An alternative way to alleviate the decoupling of talent and economic advantage, consistent with the notion of libertarianism, is competition. The more competitive an economy is, the better is its allocation of talent.[79]

In a highly competitive environment the advantage of an agent's social background diminishes. Take the example of family enterprises. A second generation entrepreneur running the family business, but lacking entrepreneurial talent may do fine in a monopolistic market. The skills passed on from her parents are sufficient to run the enterprise within the prevailing economic environment. An increase in competition would confront the entrepreneur with an altered market environment she has learned nothing about. The advantage of her social background concerning long-run family effects has diminished.

Long-Run Effects, Short-Run Constraints and UBI

More competition leads to a better allocation of talent and a better allocation of talent induces competition.[80] The misallocation of talent resulting from short-run credit constraints can be diminished by redistribution. The redistributive policy commonly discussed in the context of the allocation of talent is bequest taxation. A proportional tax on bequests, whose revenue is distributed to fund the young. Proponents of bequest taxation argue that its advantage is twofold: the tax diminishes the starting advantage of children of the relatively wealthy while at the same time improving the starting position of the less advantaged. However,

[78]Mora (2007), p9.
[79]Mora (2007), p13.
[80]Mora (2007), p14.

a tax rate yielding the first effect, hence diminishing the starting advantage of wealthy beneficiaries, had to be impracticably and inefficiently high.

What is more, redistributing to the young may have been a good idea in pre-informational, industrial societies characterized by lifetime jobs. But labor markets are increasingly characterized by continually changing demand for new skills and require permanent education. The advantage of, say, an unconditional basic income over education subsidies for the young only, is the formers payment of regular installments over an individual's lifetime. A basic income provides incentives for second-chance education and can reduce the financial risk of going into business for oneself. Either way, a basic income can help finding and developing ones talents even after entrance to the labor force. For the young, facing the decision whether to enter the labor force for financial reasons or continuing education, the payment of a regular installment from 16 of age, for example, would dramatically reduce parental dependence.

Thus, the credit constraint can be alleviated by the introduction of an unconditional basic income. A better short-run allocation will induce more competition, and by doing so, the long-run family effects eventually diminish. Moreover, the discussion of the allocation of talent brings a new aspect to the analysis of labor supply. If leisure is used for education or setting up a business, leisure may not only be of value in a welfare context. The investments in human capital undertaken in 'non-labor time' may very well yield efficiency improvements in terms of income later.

3.6 Concluding Comments

The chapter started by asserting that due to informational constraints efficiency and equity considerations *can't* be addressed separately. The chapter ended with the finding that due to the prevailing misallocation of talent, efficiency and equity considerations *shouldn't* be addressed separately if one intends to enhance economic efficiency. *Equality of opportunity* has proven to be the link between the

normative aspects in the previous chapter and the positive analysis of an unconditional basic income in the current chapter.

4 Empirics

The previous chapter was primarily concerned with behavior responses to changes in the tax/benefit structure. Both supply and demand side responses have been discussed by using simple economic models. Following the quote credited to John Maynard Keynes, "it's better to be roughly right than precisely wrong", the aim of the analysis was not to provide exact forecasts of behavioral responses in real world economies. The purpose of the simulations and conclusions drawn was to get an intuition for the diversity of mechanisms at work and to raise the awareness of the interdependence of equity and efficiency concerns.

However, the most important point, at least to the ones directly concerned, is the new tax/benefit scheme's impact on the distribution of disposable income. There will be winners and losers, and identifying who will gain income and who will have to forgo part of her disposable income indicates the redistributive effects of an altered tax/benefit structure. Compared to the no tax case discussed in the labor supply discussion, where the winners could clearly be identified as the least advantaged, some of the least advantaged may lose under a BIFT scheme. The first part of this chapter is dedicated to the impact of different BIFT schemes to the distribution of disposable income across individuals and households.

4.1 Redistributive Effects of BIFT Schemes

The analysis of the redistributive effects of different basic income schemes is (like the majority of tax/benefit microsimulation models) purely arithmetical. The simulation is based on Austrian EU-SILC microdata from 2004. EU-SILC is a 'community Statistics about Income and Living Conditions of households' of 25 EU

member states (since 2005) plus Turkey and Switzerland and the new EU-members Bulgaria and Romania (since 2007). Unfortunately, the availability of EU-SILC data for this thesis was limited to Austrian statistics from the 2004 census and subsequently no international comparisons can't be made. Nevertheless, Austria may serve as a good example, since it is maintaining a high level welfare state.

Individuals and households have been ranked and partitioned into deciles according to their annual after tax labor income plus monetary government and national insurance transfers including net old-age pensions. The data cover characteristics of individuals from 16 years of age, which is roughly the age of possible entrance to the labor force. The sample includes 4521 households and 9261 individuals, thereof 5217 members of the labor force, including 78 percent full time workers, 15.4 percent half time workers and 6.6 percent unemployed. 2436 individuals are retired and 1608 individuals are either students (540), housewives/men (901), handicapped (38) or not in the labor force for other reasons. The assignment of individuals to either of the groups rests on self-assesment of the respective interviewees. It's not possible to draw a sharp line between, say, members of the labor force and retirees, since some members of the labor force are eligible to old-age pension and some retirees earn labor income in addition to their pension. An exception was made on household level. All 2810 households assigned to the labor force gain no income from old-age pensions. Thus, if there is at least one retired household member, the household is assigned to the retirees (1711 households). Table 4.1 gives a summary of the relevant average annual income indicators for both individuals and households.

As the household summary in table 4.1 shows, transfers excluding net pensions are correlated with the number of individuals per household. This is due to the impact of family allowances, which increase in the number of children. The number of individuals per households itself rises with income.

Some of the relevant government transfers are reported at household level only. These include family allowances, means-tested welfare aid and housing subsidies. In order to obtain individual total transfers, the revenue from the respective ben-

Table 4.1: Average Individual and Household Characteristics of All Individuals older than 16 by Decile

Individuals

Decile	After tax, after transfers labor and pension income	Gross labor income	Labor taxes plus NIC	Total transfers	Transfers excluding net pensions	Net pensions	Individuals per household
1	€496	51	7	452	432	20	3.1
2	3,109	931	142	2,319	1,893	426	3.5
3	6,804	3,566	779	4,017	2,087	1,930	3.1
4	9,938	6,632	1,781	5,088	1,922	3,166	2.9
5	12,857	9,912	2,600	5,545	1,805	3,740	2.7
6	15,281	11,756	3,157	6,682	1,812	4,870	2.8
7	17,753	16,166	4,552	6,140	1,795	4,344	2.8
8	20,690	20,530	6,215	6,374	1,676	4,699	2.7
9	24,895	27,156	8,658	6,397	1,862	4,535	2.9
10	40,419	49,380	17,918	8,957	1,882	7,075	2.9

Households

Decile	After tax, after transfers labor and pension income	Gross labor income	Labor taxes plus NIC	Total transfers	Transfers excluding net pensions	Net pensions	Individuals per household
1	€6,964	2,587	858	5,235	2,029	3,207	1.4
2	13,215	6,350	1,610	8,475	2,395	6,079	1.5
3	17,275	10,607	2,839	9,508	2,296	7,212	1.7
4	21,250	15,141	4,414	10,523	2,865	7,657	2.0
5	25,381	20,569	5,946	10,758	3,914	6,844	2.4
6	29,766	25,578	7,555	11,743	4,161	7,582	2.7
7	34,780	31,637	9,512	12,655	4,365	8,290	2.8
8	40,636	43,351	13,218	10,503	4,398	6,105	3.1
9	48,785	54,383	17,122	11,524	4,089	7,435	3.2
10	73,948	89,226	30,836	15,557	4,659	10,898	3.6

Table 4.2: Average Individual and Household Characteristics of the Labor Force by Decile

Individuals

Decile	After tax, after transfers labor and pension income	Gross labor income	Labor taxes plus NIC	Total transfers	Transfers excluding net pensions	Net pensions	Individuals per household
1	€3,232	2,330	437	1,339	1,335	4	3.4
2	7,785	7,428	1,938	2,294	2,272	23	3.2
3	10,897	12,147	3,140	1,890	1,858	31	3.1
4	13,591	16,649	4,418	1,360	1,360	0	3.0
5	15,872	20,124	5,482	1,230	1,230	0	3.0
6	17,912	22,713	6,398	1,596	1,531	65	3.1
7	20,304	26,976	8,100	1,428	1,410	18	3.0
8	23,150	31,153	9,716	1,714	1,704	9	3.2
9	27,497	38,631	12,933	1,799	1,755	44	3.1
10	43,940	66,383	24,496	2,053	1,909	145	3.2

Households

Decile	After tax, after transfers labor and pension income	Gross labor income	Labor taxes plus NIC	Total transfers	Transfers excluding net pensions	Net pensions	Individuals per household
1	€6,584	4,705	1,522	3,400	3,400	0	1.6
2	8,888	13,576	3,497	4,060	4,060	0	1.7
3	11,480	21,011	5,877	3,604	3,604	0	2.0
4	14,258	25,464	7,411	4,963	4,963	0	2.2
5	16,940	30,764	8,982	5,274	5,274	0	2.3
6	19,472	37,087	10,970	5,204	5,204	0	2.5
7	22,502	44,068	13,178	5,305	5,305	0	2.7
8	25,855	53,776	16,937	4,750	4,750	0	2.8
9	30,742	65,283	20,692	4,858	4,858	0	3.0
10	45,257	104,534	36,679	5,104	5,104	0	3.5

Table 4.3: Average Individual and Household Characteristics of Retirees by Decile

Individuals

Decile	After tax, after transfers labor and pension income	Gross labor income	Labor taxes plus NIC	Total transfers	Transfers excluding net pensions	Net pensions	Individuals per household
1	€2,562	77	9	2,494	211	2,284	2.5
2	7,235	173	28	7,090	1,072	6,017	2.5
3	9,566	286	91	9,371	1,361	8,010	2.3
4	11,652	468	113	11,297	1,739	9,558	2.1
5	13,567	621	153	13,099	1,777	11,321	2.1
6	15,277	508	132	14,901	2,309	12,592	2.3
7	17,284	995	297	16,585	2,643	13,941	2.2
8	19,678	1,269	380	18,788	2,015	16,774	2.2
9	23,668	2,543	677	21,802	2,380	19,422	2.0
10	39,704	13,180	4,414	30,938	1,410	29,528	1.9

Households

Decile	After tax, after transfers labor and pension income	Gross labor income	Labor taxes plus NIC	Total transfers	Transfers excluding net pensions	Net pensions	Individuals per household
1	€7,651	140	17	7,528	313	7,214	1.1
2	12,286	574	144	11,856	454	11,401	1.2
3	15,416	855	217	14,778	291	14,486	1.4
4	18,668	1,449	329	17,547	879	16,668	1.7
5	22,407	3,078	870	20,199	1,226	18,973	1.8
6	26,861	5,239	1,538	23,159	1,550	21,610	2.0
7	32,219	10,119	3,048	25,148	2,459	22,689	2.3
8	38,343	18,392	5,249	25,199	2,861	22,338	2.7
9	47,562	31,292	9,512	25,782	2,661	23,121	3.1
10	75,530	62,733	20,570	33,532	3,778	29,755	3.6

efits was divided equally among the household members included in the sample, hence all individuals from 16 years of age.

Aggregate Income Neutrality of a UBI

Following Atkinson, one can calculate the total amount of an affordable basic income "without moving from one's armchair [by taking] the tax rate times the tax base, minus existing revenue from income tax and employee National Insurance Contributions (NIC), plus the cost of the present social security benefits which would be abolished".[81] In other words, if total monetary transfers are abolished, the affordable basic income is calculated by keeping aggregate after tax and transfer income unchanged, subtracting after tax labor income and dividing the rest by the number of recipients. A proportional tax on labor replaces the prevailing tax structure and national insurance contributions. Tax allowances are completely abolished.

I will consider three scenarios differing in the treatment of old-age pensions. scheme A completely abolishes pensions in favor of a basic income, scheme B broadens the tax base to gross pensions and subsequently allows for pensions above the basic income level. Scheme C is somewhere in between, like scheme B it allows for additional pensions, but the negative impact of the latter on the level of a basic income is weakened by introducing a ceiling for individual gross pensions at €24000 per year.

Both schemes B and C are variants of a partial basic income, which can act as a compromise at the transition from conditional social security to an unconditional basic income. As stated at the beginning, the crucial idea behind a UBI is that it is paid at the same level to all citizens (above a certain age, 16 in this example). Consequently, old-age pensions and the mandatory retirement age will be abolished in favor of the basic income, optional privately financed annuities, company pensions and/or expanded participation in the labor force.

[81] Atkinson (1995), p110.

Gainers and Losers

The income neutrality of a change in the tax/benefit structure implies that there will be individuals and households who gain and some who will lose. The aim of the following analysis is not to provide a comprehensive coverage of the changes' impact on a huge variety of different characteristics or groups of agents. In addition to the impact on the population as a whole[82], two groups of agents, namely retirees (see Table 4.3) and the labor force (see Table 4.2), are considered in particular. Because retirees are the largest group of net receivers of transfers and the labor force is the net tax payer, the redistributive impact on the two groups is of particular interest.

Monetary benefits that will be abolished include family allowances, welfare aid, housing subsidies, unemployment benefits, widow's pensions, sickness allowances, disability annuities and old-age pensions. The latter are abolished completely in scheme A and partially in schemes B and C. Labor income becomes taxable from the first Euro earned and all tax allowances are abolished.

Scheme A

By abolishing all monetary benefits including old-age pensions, scheme A can sustain the highest basic income at any given tax rate. Taking a tax rate as low as 31.4%[83] yields a basic income of €5198 per year. Consequently, the break even point of scheme A is at €16554. Figure 4.1 shows the distribution of average gains and losses by after tax/after transfers income deciles for both individuals and households.

What is striking, especially when looking at the households chart, is the redistribution from low income groups to the top three deciles of the distribution. Since the tax rate is low, individuals and households with labor income gain on average, with slightly greater gains for the upper end of the distribution. The losers are individuals and households living from old-age pensions, since the latter have been

[82] Including individuals from 16 years of age.
[83] I.e. the average 2004 tax rate on labor income including social security contributions.

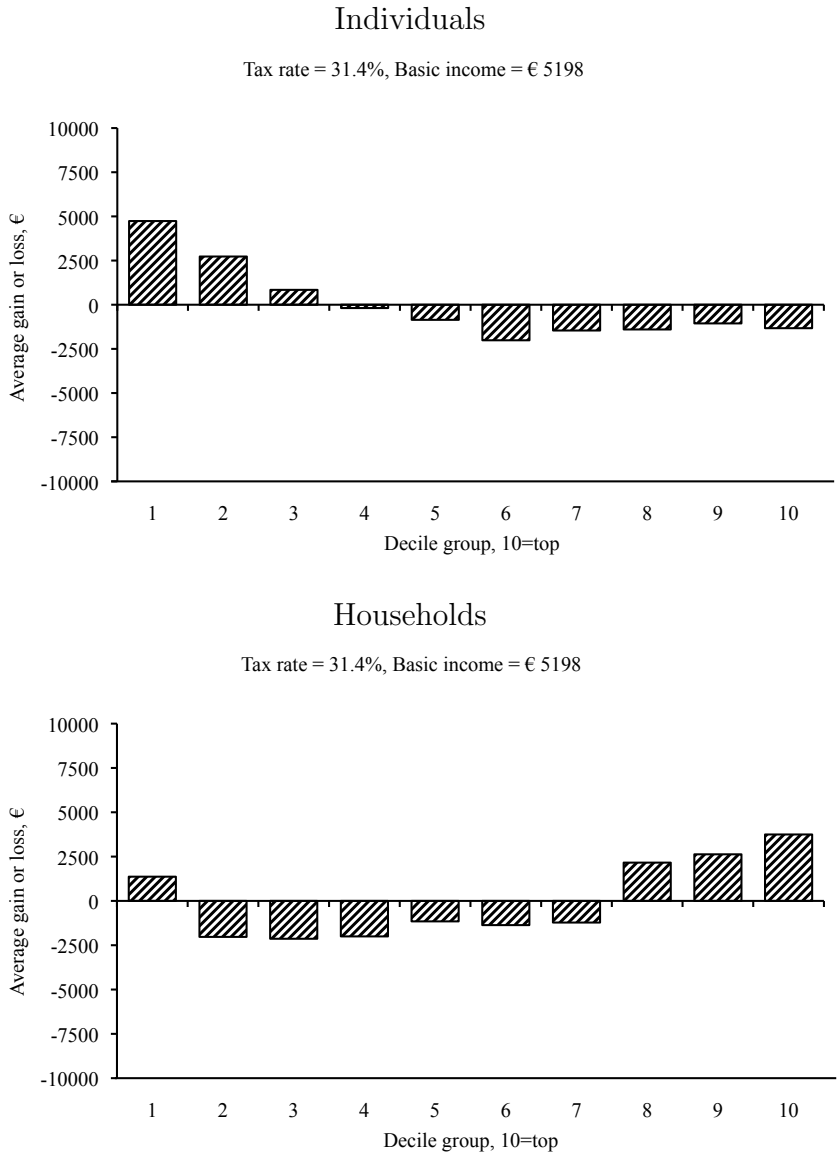


Figure 4.1: Average Gains and Losses, 31.4% €5198 Full BI

completely abolished in favor of a relatively modest basic income.

By increasing the tax rate to 50%[84], a basic income of €7923 can be afforded. While the redistribution from upper income to lower income individuals has increased significantly, the redistributive impact on households is less clear, although the lowest decile gains on average at expense of the highest decile.

Still, retirees with old-age pensions above basic income level will be the losers of the scheme. This can be seen by looking at the distribution of gainers and losers within decile income brackets. Contrary to the previous analysis of net gains or losses, the distribution of gainers and losers within income brackets reveals (figure 4.4), for example, that there may be indeed a quarter of individuals in the top decile who gain from the reform, although on average the top ten percent lose about 19.3% of after tax-transfer labor and pension income. Most of the losers are likely to be retirees.

If redistribution from higher to lower deciles is the indicator of the desirability of a certain basic income scheme, a scheme performs better, the greater are the gains of the low income groups compared to the losses of the high income groups. As we have seen, it is not sufficient to consider only the impact on the total population. The more similar the distribution of net gains and losses to the upper graph in figure 4.3, hence moving diagonal from the upper left corner to the bottom right, for both the labor force and the retirees and both individual and household levels, the higher is the level of redistribution from the wealthy to the poor across groups. The same is true for the distribution of gains and losses within income deciles.

Scheme B

We have seen in the analysis of Scheme A that a higher tax rate and subsequently a higher basic income level have greater redistributive impact. Scheme B retains a tax rate of 50%, but diminishes the redistribution from retirees to the labor

[84] I.e. the upper 2004 income tax bracket.

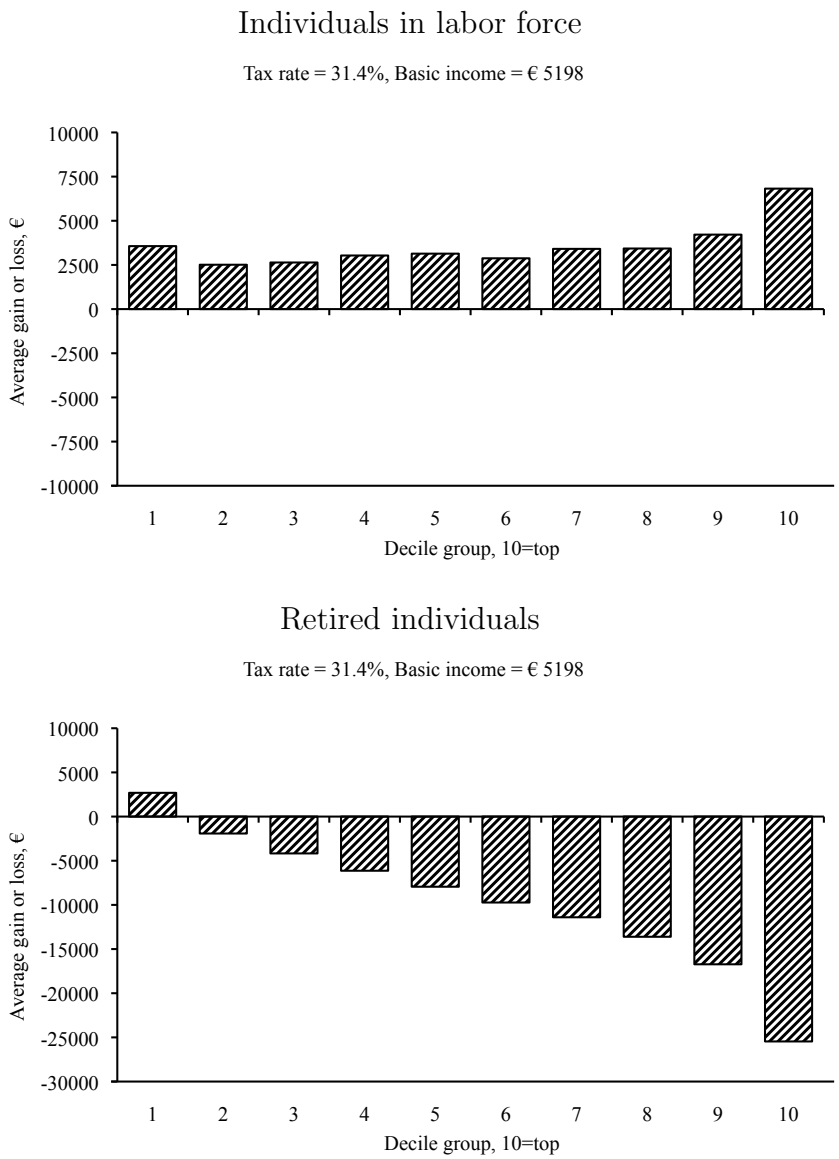


Figure 4.2: Individual Average Gains and Losses by Group, 31.4% €5198 Full BI

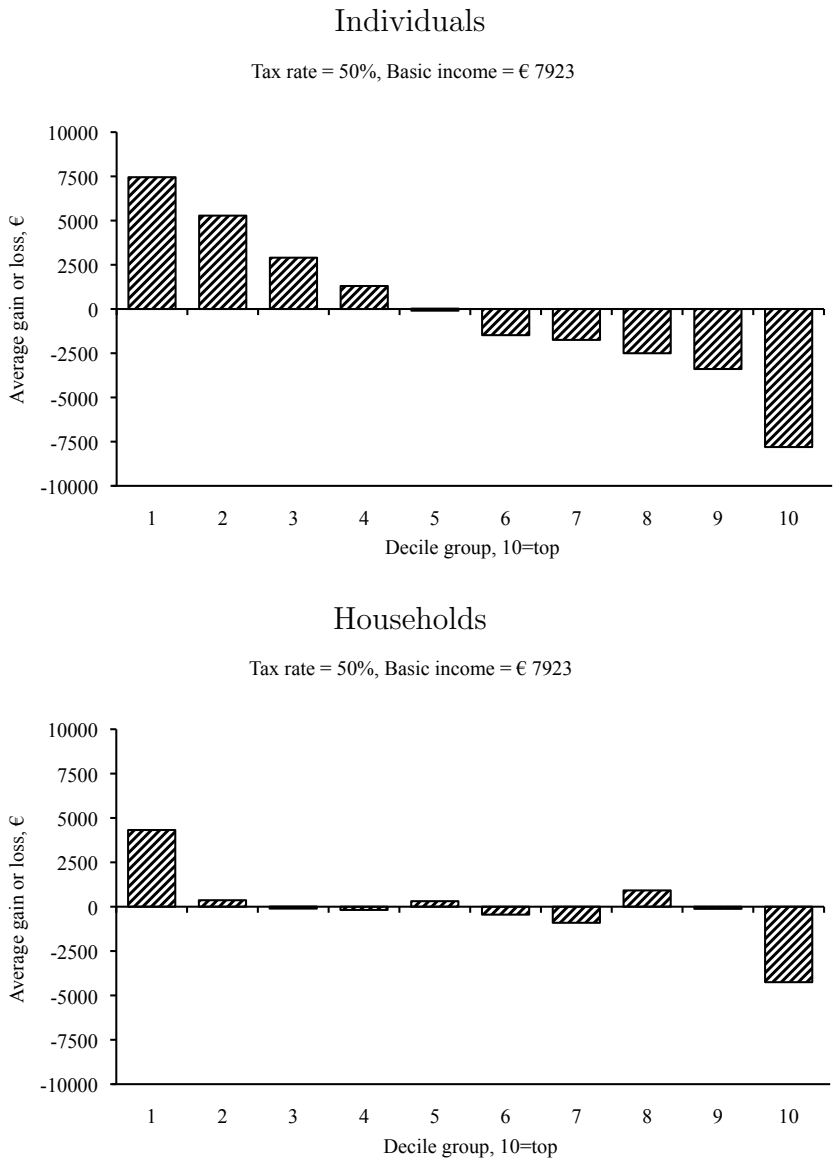


Figure 4.3: Average Gains and Losses, 50% €7923 Full BI

Figure 4.4: Gainers and Losers, 50% €7923 Full BI

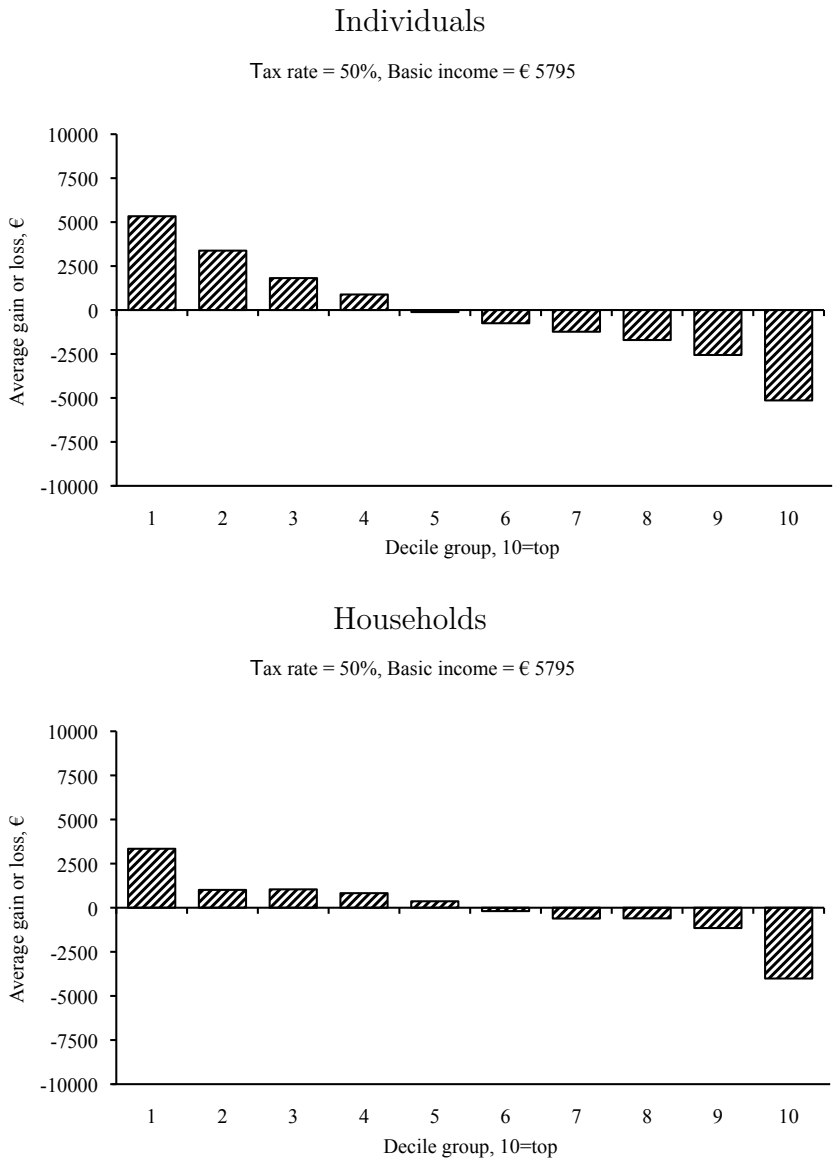


Figure 4.5: Average Gains and Losses, 50% €5795 Partial BI

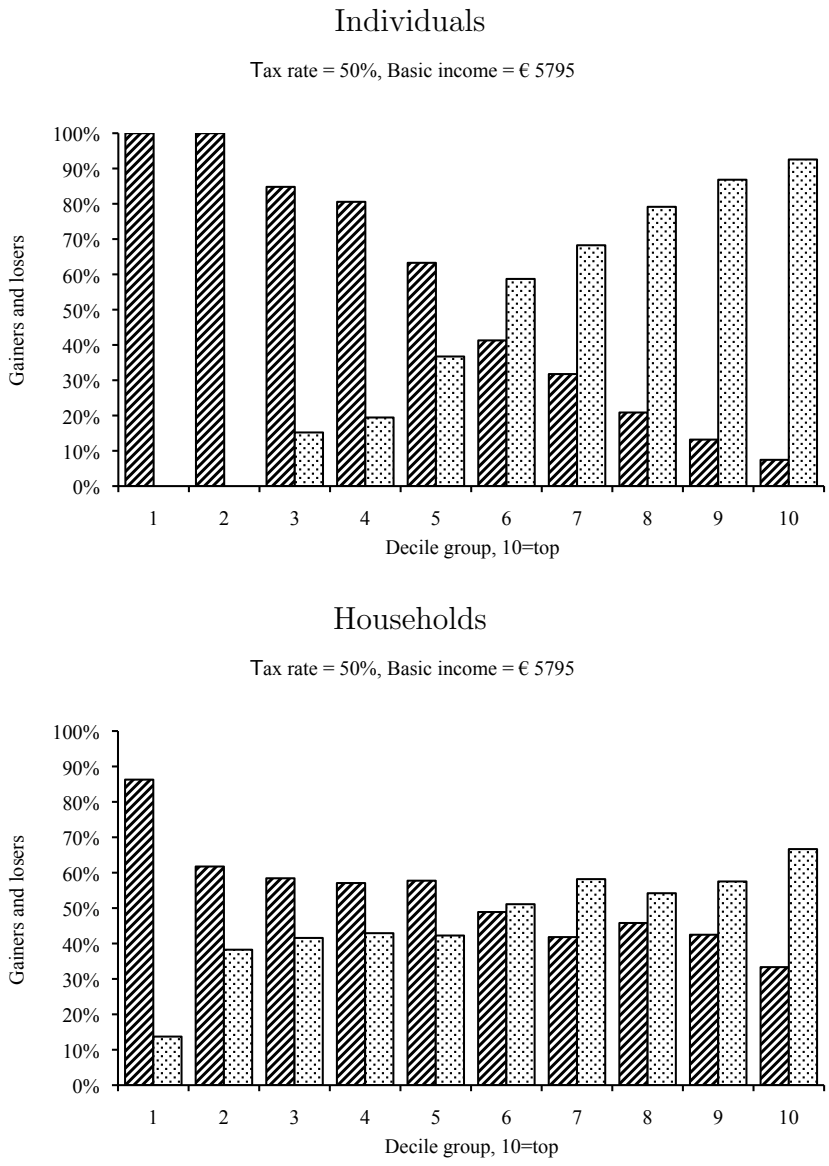


Figure 4.6: Gainers and Losers, 50% €5795 Partial BI

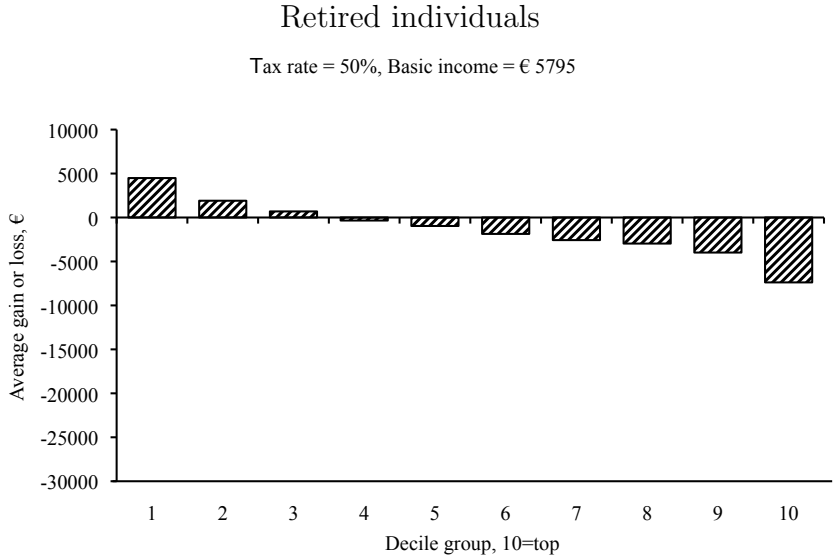


Figure 4.7: Average Gains and Losses, 50% €5795 Partial BI

force by allowing the former to keep their annuities. However, gross pensions are taxed like labor income and the basic income is paid in addition to the modified net pensions. As a consequence, the affordable level of basic income decreases to €5795 per year. Recalculating net gains for the whole sample yields figure 4.5.

Scheme C

The arithmetics of scheme C equal the arithmetics of scheme B with one exception: gross old-age pensions are capped at €24000 per year. Therefore, the affordable basic income financed by a tax rate of 50% is slightly greater, amounting to €6276 per year. This yields an increase in redistributive progressivity and a higher level of redistribution from the top income decile of retirees to the lower income deciles of the total population.

Results for the total population are similar to scheme B with a slight increase in the redistributive impact. Both average gains and losses and the distribution of gainers and losers have moved towards greater redistribution from the wealthy to

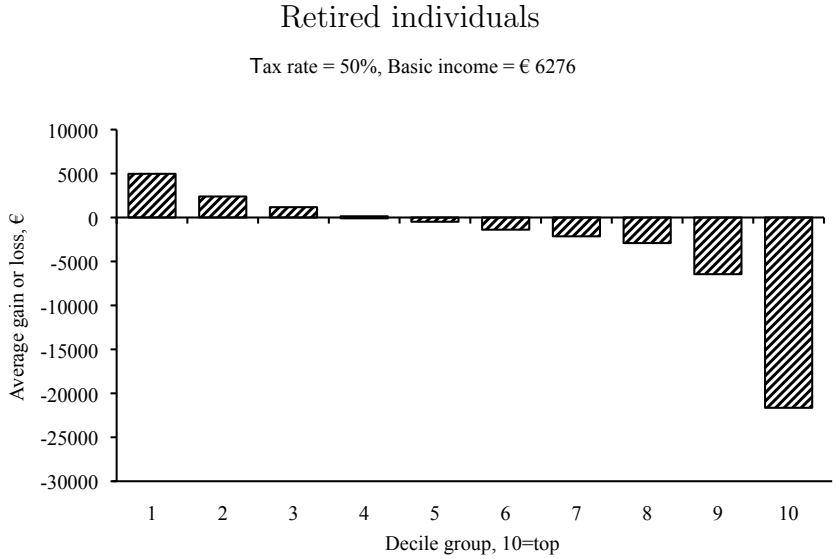


Figure 4.8: Average Gains and Losses, 50% €6276 Partial BI

the poor. In scheme B, the amount of gainers relative to losers drops below 1 as we move from the 5th to the 6th decile, while in scheme C this threshold is shifted to the right by one decile.

So far we have analyzed the average net gains of a transition from conditional welfare to an unconditional basic income scheme. By plotting the *share of gainers and losers* within income deciles and by comparing the net gains of the labor force to the net gains of retirees, we were able to gain greater insight to the redistributive impact of different policies. However, we no nothing about the *magnitude of gains and losses* within decile groups. Knowing about the magnitudes of gains and losses and finding out which groups are affected most is of importance if we want to design a partial basic income scheme aiming at minimizing hardships in the transition from conditional welfare to a full basic income. A scatter plot with after tax and transfers income assigned to the horizontal axis and relative net gains assigned to the vertical axis shows the net gain of every single individual and household (see Figures 4.11 and 4.12).

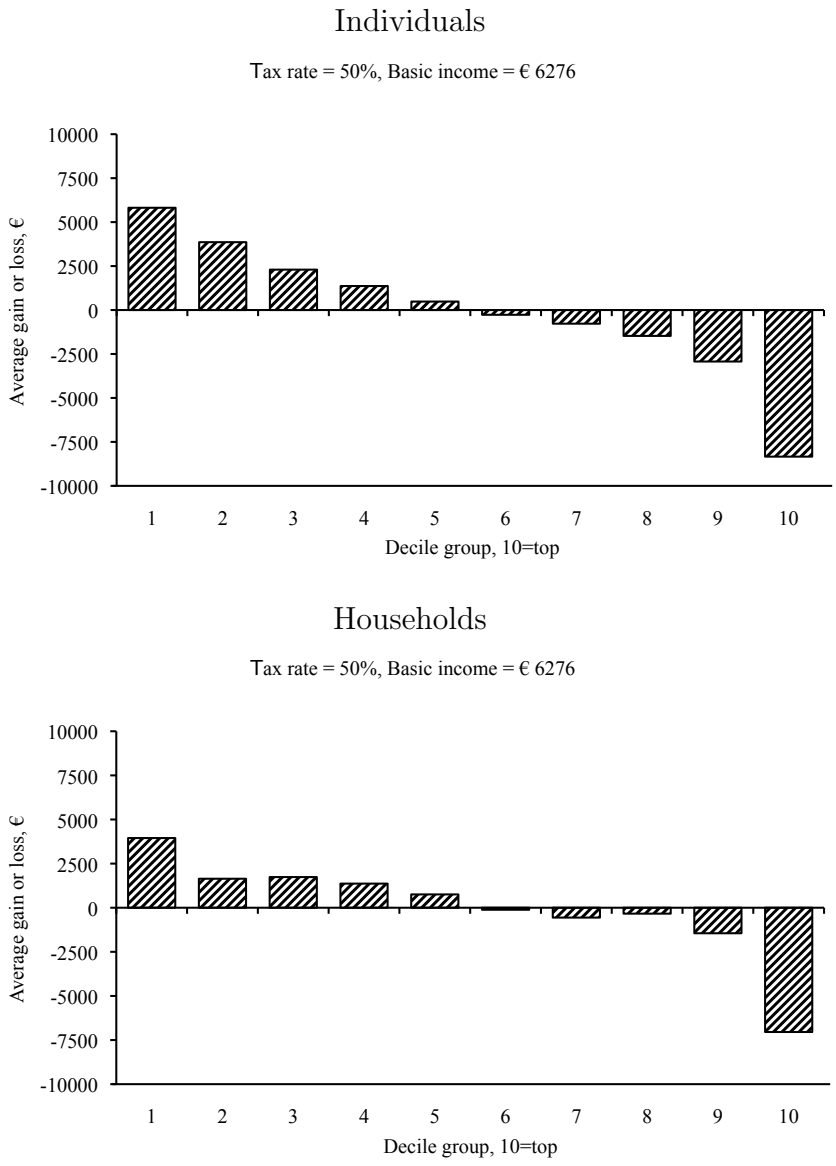


Figure 4.9: Average Gains and Losses, 50% €6276 Partial BI

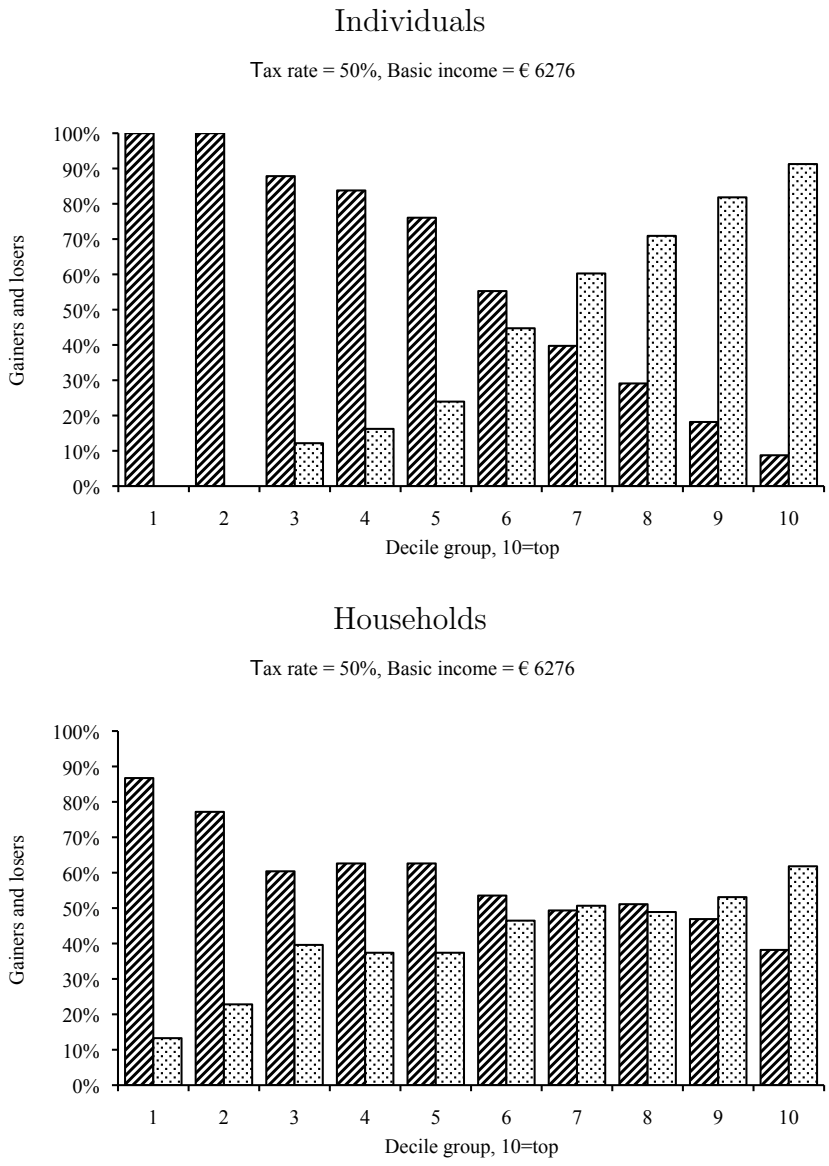


Figure 4.10: Gainers and Losers, 50% €6276 Partial BI

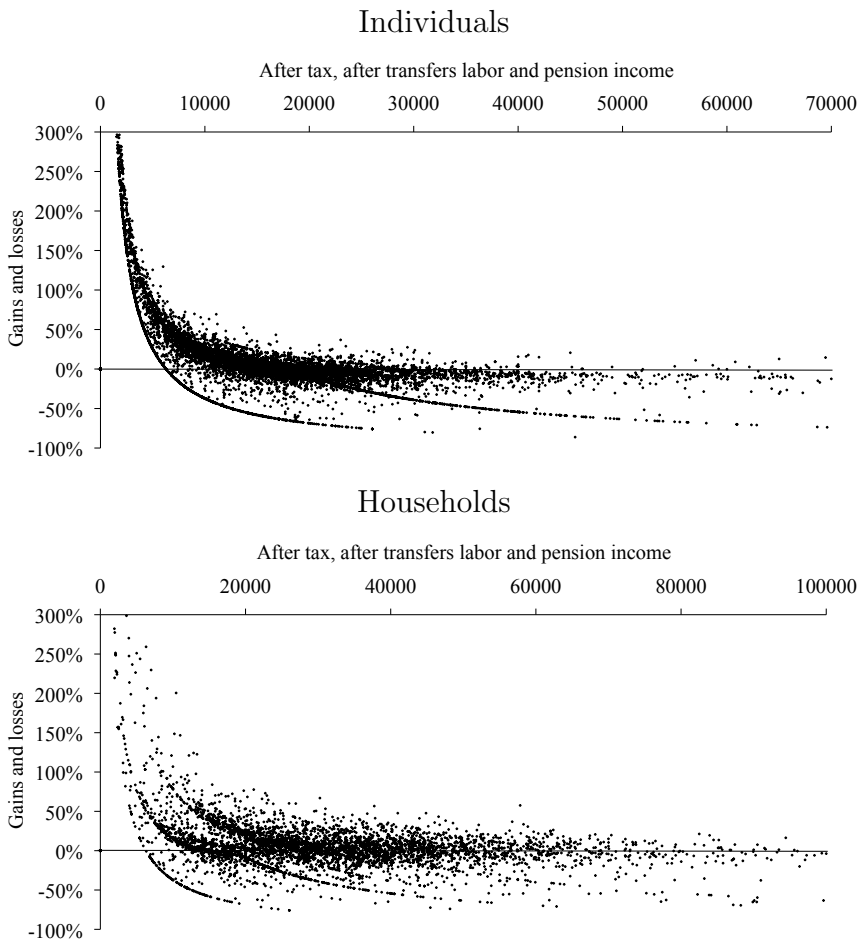


Figure 4.11: Gains and Losses per Individual and Household, 50% €6276 Partial BI

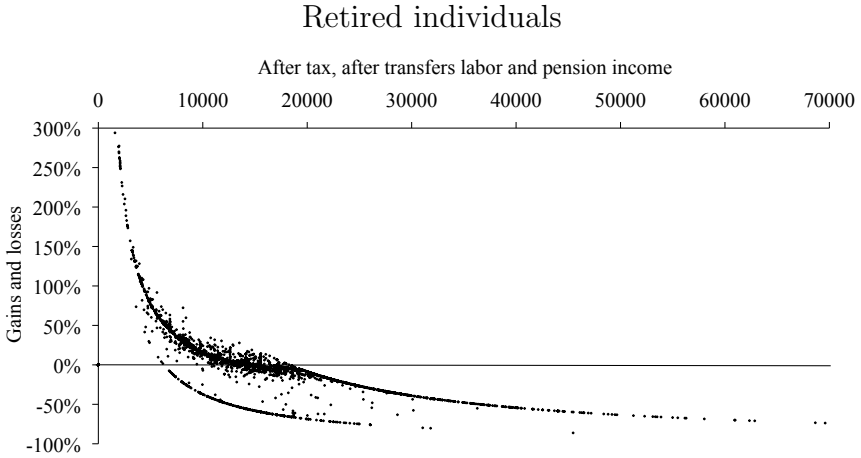


Figure 4.12: Gains and Losses per Individual, 50% €6276 Partial BI

Individual retirees on old-age pension can easily be identified by the curve leading to the bottom right corner. What we have to be concerned of is the second clearly visible curve to the left. It is not yet clear, which groups of individuals are affected by such great losses at relatively low levels of income. Likely candidates are long-time unemployed, especially those who were eligible to high unemployment benefits, and the disabled, especially those ranking among the retirees. Table 4.3 shows that retirees gain income from transfers other than old-age pensions. Most of these transfers are invalidity pensions that are abolished and replaced by a comparatively low basic income. As it turns out, figure 4.12 confirms the presumption.

It should have become clear that designing a transitional partial basic income scheme is a complex task. Policy makers have to be aware of the redistributive impact across and, especially, within income groups. The task becomes even more complex, when the impact on households is accounted for. The renunciation from conditional welfare yields different impacts on families, single mothers, retirees, unemployed and the disabled. The analysis of the respective redistributive impacts may lead to a revision of a certain scheme.

4.2 The Aggregate Behavior Response

The aim of this section is to estimate the labor force's aggregate behavior response to the introduction of a basic income flat tax scheme. The analysis is similar to the simulations done in the previous chapter. The major difference though, aside from using real data, is the starting position. The hypothetical agents were originally situated in a no-tax position. Each individual in the sample is subject to a specific tax rate and divers types and levels of transfers. Thus, applying the Browning and Johnson labor supply function requires information on individual effective marginal and average tax rates.

Effective Marginal Tax Rates

For calculating the effective, or implicit, marginal tax rates, the procedure suggested by Browning and Johnson is applied.[85] All individuals in the labor force are ranked according to their gross labor income. Then, the effective marginal tax rates are calculated subject to the average decrease in transfers and the average increase in taxes for each €1000 increment in gross labor income. Average tax rates are calculated by relating after tax and transfer income to gross labor income. Table 4.4 shows the average and weighted effective marginal tax rates by gross income quintile.

As expected, due to income tested benefit withdrawal, the first income quintile faces a high marginal tax rate of nearly 85% (the poverty trap). The respective average tax rate is negative, granting individuals in the first quintile an average after tax and benefits income of more than one and a half of their gross labor income. The effective marginal tax rate is lowest for medium income earners and rises back up to 46% for high income earners. Thus, the distribution of marginal tax rates from low income earners to high income earners yields a U-shape. Indeed, this is in sharp contrast to Brown's findings, "that if one were to draw a graph with marginal tax rates on the vertical axis and incomes on the horizontal axis,

[85] Browning and Johnson (1984), pp184.

Table 4.4: Labor Force: Average Gross Labor Income, Marginal Tax Rate and Average Tax Rate by Quintile

Qunitile	Gross labor income	Marginal tax rate	Average tax rate
1	€3,894	84.8%	-55.6%
2	14,116	36.9%	13.4%
3	21,402	30.2%	21.7%
4	29,102	38.2%	25.8%
5	53,455	45.9%	34.3%

the graph of optimal marginal tax rates would look something like an upside-down U".[86] This finding implies that a basic income flat tax scheme with constant marginal tax rates across income in principle yields a more efficient tax structure.

Labor Supply Elasticities

As stated above, the Browning and Johnson labor supply function allows us to calculate the compensated and uncompensated labor supply elasticities with respect to different combinations of marginal and average tax rates for given income and substitution effects parameters. Since equal parameter values are assigned to all members of the labor force, the resulting average elasticities disregard individual characteristics such as sex or marital status. However, the results are weighted by hours supplied and the direction of the bias is ambiguous.

Average compensated and uncompensated elasticities are obtained for each quintile and the labor force as a whole, according to the method applied by Browning and Johnson. Compensated wage elasticities are calculated by changing the marginal tax rate while keeping the average tax rate xed. Uncompensated wage elasticities are calculated by simultaneously changing both marginal and average tax rates by the same amount.[87] Table 4.5 shows the results for the benchmark parameters

[86]Brown, 1983, pp162.
[87]Browning and Johnson (1984), p188.

and two alternative combinations of γ and δ.

Table 4.5: Labor Force: Labor Supply Elasticities

γ	3.25		2.5		3.25	
δ	.2		.2		0	
	Elasticity					
Qunitile	Uncompensated	Compensated	Uncompensated	Compensated	Uncompensated	Compensated
1	3.158	3.079	3.357	3.278	3.079	3.079
2	.098	.122	.183	.207	.122	.122
3	.028	.072	.096	.139	.072	.072
4	.114	.169	.225	.280	.169	.169
5	.276	.356	.446	.526	.356	.356
Overall	.267	.314	.409	.456	.314	.314

Comparing the elasticities obtained with the benchmark parameters to elasticities reported by econometric literature, could verify the plausibility of the parameter values. Unfortunately, economists are far from reliably estimating labor supply elasticities. According to a survey of non-linear budget constraints models in Blundell and MaCurdy, estimates for uncompensated and compensated elasticities reach from 0 and .01 (MaCurdy, 1990, US) to .025 and .35 (Flood and MaCurdy, 1992, Sweden) for married men and from -.01 and -.028 (Kuismanen, 1997, Finland) to 2.03 and 2.23 (Arrufat and Zabalza, 1986, UK) for married women.[88] Weighting the average elasticities according to the prevailing Austrian labor force participation rates of married males and females yields an uncompensated elasticity of .308 and a compensated elasticity of .41. Extending the estimates to the whole labor force by including single males and females subject to the assumption that singles can be treated like married males disregard of their gender, yields an uncompensated elasticity of .23 and a compensated elasticity of .339. Considering the large variation of estimation results, the labor supply elasticities obtained by the benchmark parameters sound reasonable.

[88] Blundell and MaCurdy, 1999, pp1646.

Table 4.6: Labor Force: Aggregate Behavior Response, 50% €6276 Partial BI

			Before		After				
γ	δ	Quintile	Gross labor income	After tax, after transfers labor and pension income	Gross labor income	Net labor and basic income	Net gain	Losses/ Gains	Efficiency
		1	€3,894	6,060	9,297	10,920	4,860		
		2	14,990	12,979	13,806	13,322	343		
		3	21,482	16,826	19,558	16,099	-727		
		4	28,193	20,932	26,513	19,359	-1,574		
		5	53,455	35,139	52,367	32,455	-2,684		
3.25	.2	Overall	24,472	18,429	24,376	18,463	35	.958	.996
		1	3,894	6,060	10,740	11,641	5,581		
		2	14,990	12,979	13,353	13,096	117		
		3	21,482	16,826	18,586	15,613	-1,212		
		4	28,193	20,932	25,685	18,945	-1,987		
		5	53,455	35,139	51,790	32,167	-2,972		
2.5	.2	Overall	24,472	18,429	24,098	18,324	-105	1.083	.985
		1	3,894	6,060	8,418	10,481	4,420		
		2	14,990	12,979	13,960	13,399	421		
		3	21,482	16,826	19,624	16,132	-694		
		4	28,193	20,932	26,388	19,296	-1,636		
		5	53,455	35,139	51,959	32,251	-2,888		
3.25	0	Overall	24,472	18,429	24,136	18,343	-85	1.078	.986

Aggregate Labor Supply

Calculating the labor supply response for each quintile and the labor force as a whole is straightforward. Labor supply changes are measured in terms of income. Thus, a change in income can either be due to a change in hours supplied or effort made. Other than in the previous simulations, the basic income at a given tax rate is assumed to be constant. The efficiency change in terms of income is reflected by the ratio of before and after reform gross labor income.

Given marginal and average tax rates, the Browning and Johnson labor supply function is capable of estimating labor supply in the no tax position. By knowing the income in the no tax position, the average tax rates for the hypothetical case of a basic income flat tax scheme introduced in the no tax position can be calculated. Together with the constant marginal tax rate of the scheme, the average tax rates are applied to the labor supply function to obtain the change in labor supply relative to the no tax position. Table 4.5 shows the net gains of the implementation of Scheme C with a basic income of €6276 and a tax rate of 50% for each quintile and the labor force as a whole.

As can be seen, low income individuals increase their labor supply dramatically. This is mainly due to an increase in incentives following the reduction of the marginal tax rate from nearly 85% to 50%. Subsequently, agents who faced relatively low marginal tax rates before the reform have decreased their labor supply. For all three combinations of γ and δ, the overall efficiency loss in terms of aggregate labor income is relatively small. Applying the benchmark parameters yields an efficiency reduction to 99.6% of before reform aggregate income.

5 Conclusion

The aim of this thesis was to provide a normative justification and an analysis of economic effects of a basic income policy in the light of the most frequent objections to such a proposal. As it turned out, a basic income policy, more specificially a basic income flat tax policy, is compatible with libertarian theories of justice based on Lockean principles. Locke's proviso, "enough, and as good, left in common for others" leaves no other option than a redistribution of income from the proprietors of a scarce resource to the community as a whole.

The existence of employment rents and involuntary unemployment justifies the extension of scarce resources from external endowments in a narrower sense to jobs as assets. It could be shown that a basic income is in principle capable of decreasing the level of involuntary unemplomet by at the same time leaving employment and gross earnings unchanged. The discussion of the misallocation of talent suggested that the (temporary) voluntary unemployed, those who reduce their labor supply and those who are not in the labor force may indeed use the unconditional payment for further education or going into business for oneself. Thus, productivity and overall efficiency are likely to rise in the long run.

What is more, as the simulation of aggregate labor supply effects in the previous chapter showed, the impact of a basic income financed by a high tax rate of 50 percent for all workers from the first Euro earned, is modest. In the simulation, the reduction in labor supply of the upper quintiles of the income distribution is almost offset by the rise of the lowest quintile's labor supply. This is due to the abolishment of the unemployment trap, by replacing the high effective marginal tax rates the least advantaged face in conditional welfare schemes, with a relatively lower marginal tax rate of a basic income scheme.

As far as the redistributive impact is concerned, low income earners are the net gainers of a (substantial) basic income policy like the one presented as scheme C. However, the (voluntary) unemployed are worse off, since the level of basic income, even if it is financed by a 50 percent tax rate, is lower than the average unemployment assistance in the conditional welfare scheme. This may not be a problem once the transition from conditional to unconditional social security is completed. Rational agents are assumed to supplement the basic income with a voluntary social security insurance and private pension plans. However, further research on the transition from conditional welfare to an unconditional basic income policy has to be made.

I hope that the contributions made in this thesis help to attain a deeper understanding of both the ethical and economic perspectives of a basic income flat tax policy, which I think to be a powerful tool to meet the economic challenges of the 21^{st} century.

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