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ABSTRACT

An optimal linear world income tax that maximizes a border-neutral social welfare function provides a drastic reduction in world consumption inequality, dropping the Gini coefficient from 0.69 to 0.25. In contrast, an optimal decentralized (i.e., within countries) redistribution has a miniscule effect on world income inequality. Thus, the traditional public finance concern about the excess burden of redistribution cannot explain why there is so little world redistribution.

Actual foreign aid is vastly lower than the transfers under the simulated world income tax, suggesting that countries such as the United States either place a much lower value on the welfare of foreigners or else expect that a very significant fraction of cross-border transfers is wasted. The product of the welfare weight and one minus the share of transfers that are wasted constitutes an implied weight that the United States assigns to foreigners. We calculate that value to be as low as 1/2000 of the value put on the welfare of an American, suggesting that U.S. policy implicitly assumes either that essentially all transfers are wasted or places essentially no value on the welfare of the citizens of the poorest countries.

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1 Introduction

In May, 2002 rock star Bono and U.S. Secretary of the Treasury Paul O'Neill toured Africa together. At each stop they publicly aired their different views on the need and effectiveness of foreign aid. Bono insisted that more aid is needed to lift Africa out of desperate poverty, implying that that it is largely the mendacity of developed countries that prevents more aid. Secretary O'Neill argued that much aid has done little to reduce poverty, owing in large part to waste and corruption.

This high-profile tour generated wide media coverage of global poverty and global income inequality. But the same debate has been ongoing for many years. Gross disparities of income across countries[1] have drawn attention to the small amount of resources transferred from the rich countries of the world to the poor countries, and have given rise to calls that the rich countries devote much more of their resources to foreign aid. For example, Sachs (2001) has called for the United States to double its aid budget and devote the funds to disease control, primary education, clean water, and other vital needs of impoverished places.

The unwillingness of the United States and other developed countries to substantially raise their foreign aid may reflect one or both of two factors: the citizens of rich countries place a very low value on the welfare of the citizens of poor countries, or they may shy away from transfers because of the large efficiency cost that would plague such efforts. This cost may have two sources. One is the concern expressed by Secretary O'Neill and others that the funds would be not reach the targeted groups due to waste and corruption. Another type of cost relates to the traditional concern of public finance economists that the process of taxing the well off and transferring the proceeds to the less well off causes disincentives. The economic cost of these disincentives limits the optimal amount of cross-country transfers that would be undertaken even by a policymaker with egalitarian impulses to redistribute from the globally rich to the globally poor.

From this public finance perspective, it is clear that the problem of global redistribution has the same structure as the problem each country faces—trading off the efficiency costs of a progressive tax system against the more equal distribution of welfare it achieves. In fact, most countries achieve some degree of redistribution through their own tax-and-transfer system. Clearly, the extent of overall, world, redistribution is small relative to world inequality because cross-country transfers are minimal. The question of whether these minimal transfers are at least approximately *optimal* and what the optimal transfers would be requires further investigation, however.

In this paper we explore this question quantitatively as follows. We first calculate each country's optimal redistributive policy, assuming that each country sets its tax system to maximize a concave social welfare function of individual utility levels, knowing that the tax system will influence individuals' choices. Then each country will set its own tax schedule that is more or less progressive based on the distribution of incomes (more precisely, the ability to earn income) *within that country.* Even though the social welfare function is concave, the desire to redistribute is constrained by the economic cost of the marginal tax rates the redistribution requires. Using data on income

[1] Milanovic (2002) has shown that the major source of world income inequality is cross-country differences.

inequality and assumptions about utility functions that imply how responsive behavior is to taxation, we calculate the optimal income tax system in each of 118 countries and characterize the amount of redistribution that these decentralized systems produce.

Now we consider the hypothetical case of a world income tax, where the same tax schedule applies to everyone regardless of where they live, and which therefore allows for transfers across countries. We first consider the case where there is no waste (other than excess burden) from cross-country transfers and that the tax setter is *border-neutral*, meaning that each person's welfare enters the social welfare function the same regardless of where he or she lives. Assuming further that the world decision maker has the same preferences as each country about the tradeoff between the mean and distribution of incomes (i.e., an equally concave social welfare function), and faces the same costs from imposing redistribution, we can solve for the optimal progressivity of the world income tax. The solution depends on the inequality of world incomes, and not on the degree of inequality within countries.

The results of simulating these stylized models reveal that the decentralized tax-and-transfer scheme makes hardly any dent in the world income inequality. This is so even though countries pick progressive tax systems on their own. In contrast, an optimal world income tax would significantly reduce the world inequality of consumption, albeit with a larger efficiency cost and at the cost of a reduction in welfare of citizens of the richest 25 countries. Thus, we conclude that a concern about the excess burden of cross-country transfers cannot explain why foreign aid is so low--what limits these transfers is not the efficiency cost of the redistribution.

What might? One possibility is that weights put on the welfare of foreigners are lower than those put on the welfare of citizens, as implied by Bono. Another is that transfers are not used efficiently, as implied by Secretary O'Neill. In the final section we address these possibilities by allowing the policy makers in the rich countries to place a lower value on the welfare of the citizens of other countries at any given level of income compared to their own citizens, and/or expect that a fraction of cross-country transfers would be wasted. With our parameter assumptions we cannot distinguish *between* the Bono and O'Neill scenarios, but we can calculate precisely how low the product of that relative value and the share of transfers that are wasted must be in order to generate the current level of cross-country transfers, in the form of foreign aid, given by rich to poor countries.

It is shockingly low. In our baseline case, foreigners are on average valued by the U.S. at just 16% of an average American, with the citizens of the poorest countries weighted by as little as 1/20th of one percent. The latter value implies either that U.S. puts essentially no weight on the welfare of those individuals or that 1/2000th of the transfer is wasted or a combination of both.

2 Methodology

2.1 Calculating the Optimal Linear Income Tax

Our central analytical tool is a model of the optimal income tax structure, as pioneered by Mirrlees (1971). The idea is that the government chooses an income tax function that maximizes a given social welfare function, subject to an exogenously specified revenue requirement and the constraint that individuals will choose the levels of consumption and leisure that maximize their utility subject to their own budget constraints, which depend on the tax system chosen.

There are three key elements of the problem. The first is the degree of concavity of the social welfare function, which captures how society makes the tradeoff between the sum of utilities and the distribution of utilities. Second is the elasticity of substitution between leisure and consumption in individuals' utility functions (which are assumed to be identical); this determines the amount of distortion, or welfare cost, for any given tax structure. The final element is the distribution of abilities, where an individual's ability is presumed to be equal to the pre-tax wage rate. Loosely speaking, the optimal income tax structure trades off the social welfare gains of a more equal distribution of utilities against the efficiency cost caused by the structure of marginal tax rates needed to achieve any given amount of redistribution.

Although the optimal income tax literature has explored the sensitivity of the results to various assumptions about the social welfare function, the distribution of abilities, and the magnitude of behavioral response, it has not been used to quantitatively explore the implications of a decentralized system of redistribution in a world of gross inequalities across countries. This is the task we begin below.

2.2 Choosing the Model Parameters

There are two scenarios that we wish to compare. One is a decentralized solution, in which each country selects its own optimal linear income tax system. The other one is a world income tax system, in which the decision maker designs a single linear income tax that applies to all individuals in the world. This exercise requires making a host of assumptions about the distribution of earning potential, the utility function, welfare function, behavioral elasticities and stylized economies we study. In what follows we review the main issues.

2.2.1 The Distribution of Abilities

The dispersion of abilities is critical because, in general and *ceteris paribus*, the optimal linear income tax will be more progressive (i.e., feature a higher demogrant and higher tax rate) the more unequal is the initial distribution of earning potential within the jurisdiction. Mirrlees (1971) presents an example in which widening the distribution of skills, assumed equal to wage rates, increased the optimal marginal tax rates; he concludes that the dispersion of skills necessary to imply marginal tax rates much higher than the 20 to 40 percent range is unrealistically high. In his baseline numerical simulation, he sets the value of the standard deviation of the associated normal distribution (denoted σ) in the assumed logarithmic distribution of skills to be equal to 0.39, derived from Lydall's (1968) figures for the distribution of income from employment in various countries. When Mirrlees repeated the simulation with σ=1.0, a much wider dispersion of ability, he reported that the optimal tax schedule

> "is in almost all respects very different. Tax rates are very high: a large proportion of the population is allowed to abstain from productive labour. The results seem to say that, in an economy with more intrinsic inequality in economic skill, the income tax is a more important weapon of public control than it is in an economy where the dispersion of innate skills is less. The reason is, presumably, that the labour-discouraging effects of the tax are more important, relative to the redistributive benefits, in the latter case."

Stern (1976), examining only flat-rate tax systems, corroborates Mirrlees finding. For his base case featuring an elasticity of substitution between goods and leisure of 0.4, when σ=0.39, the optimal marginal tax rate is 0.225, but it rises to 0.623 when σ=1. Cooter and Helpman (1974) perform a variety of numerical simulations, and find that for all of them the optimal marginal tax rate increased as the constant-mean ability distribution spreads out.[2]

Of course, innate ability is unobservable, so its dispersion is not knowable, either. What is available, and are collected in Deininger and Squire (1996), are estimates of Gini coefficients for 138 countries. These estimates were produced from a variety of micro data sources, and come from studies of varying quality. They identify Gini coefficients based on actual observation of individual units drawn from household surveys, based on comprehensive coverage of the population, and based on comprehensive coverage of different income sources as well as of population groups. World Bank (2000, Table 2.8) is a more recent source of Gini coefficients. These estimates are based on survey data obtained from government statistical agencies and World Bank country departments, and in many cases overlap with the Deininger and Squire (1996) observations. In our simulations, we use the World Bank (2000) estimates as the primary source, and resort to the "high-quality" observations in Deininger and Squire (1996) for countries that are not present in that dataset.

[2] Helpman and Sadka (1978) claim that this result is not general, but offer only a trivial counter-example that features a Rawlsian (maximin) social welfare function and a fixed lowest ability level of zero. They argue that there should exist counter-examples with more general social welfare functions, but admit they were unable to identify any such example.

A more vexing problem is that the studies sometimes calculate the inequality of pre-tax income, sometimes calculate the inequality of after-tax income, and sometimes calculate the inequality of consumption. Of course, none calculates the inequality of ability. By making strong assumptions about the process that generates income, one could claim to have recovered the distribution of abilities that is consistent with the data. For example, for a given and common utility function and tax system, one could convert the distribution of labor earnings into the distribution of abilities. This is the procedure we follow.

Because of the greater variability of annual income compared to annual consumption, measures of inequality based on the former will tend to be higher. Deininger and Squire report that in their sample the mean difference between the expenditure-based Gini coefficients and those based on gross income is 6.6. They also report that for the nineteen pairs of Gini coefficients computed using the Luxembourg Income study data, those based on after-tax income were on average 3 points lower than those based on gross income; this sample includes, however, only one developing country (Mexico). Clearly, the quantitative importance of this effect will depend on the effective progressivity of the tax system in place.

In what follows we assume that the distribution of abilities in each country is lognormal. Then, we parameterize the distribution so that the resulting Gini coefficient of income or consumption for a given country under a certain baseline income tax system[3] is equal to the empirical value. In this exercise, gross income is assumed to equal labor

[3] The baseline income tax system features a marginal tax rate of 0.30.

income of the individual, and both consumption and net income are assumed to correspond to after-tax income.

2.2.2 The Individual Utility Function

The individual utility function is a critical element of the problem because it determines the substitutability between leisure and consumption, which in turn reveals the marginal efficiency cost of any degree of tax progressivity. In his simulation analyses of the optimal linear income tax, Stern (1976) focuses on a constant-elasticity-of-substitution (henceforth CES) utility function with an elasticity of substitution of 0.4, based on his reading of the labor supply elasticity literature available at that time. Depending on how it is read, the literature since then suggests considering both a lower and a higher number: lower because the aggregate elasticity of substitution between leisure and consumption may be less than 0.4,[4] higher because labor supply is only one dimension of behavioral response to taxation that involves an efficiency cost, and research on the elasticity of taxable income suggests that an elasticity of 0.6 may be appropriate (Auten and Carroll 1999; Gruber and Saez 2000; Slemrod, 1998). Although in this case the relevant behavioral response is summarized by an elasticity of taxable income rather than an elasticity of substitution between consumption and leisure, in order to be comparable with most of the optimal income tax literature we retain the standard modeling. However, we assign higher behavioral responses than have been found for labor supply, in order to represent the whole range of possible responses.

Somewhat surprisingly, the "income elasticity" of optimal progressivity – do richer countries choose more progressive tax systems? – in this class of models has been almost completely ignored. Indeed, the answer is not obvious. A proportional increase in all individuals' abilities changes the set of tax systems that raise the required amount of revenue. Under certain conditions, the admissible tax systems are simply scaled up in the sense that an equi-proportionate change in all abilities, revenue, and the demogrant, holding the marginal tax rate constant, is still admissible (but perhaps no longer is optimal). However, holding taxes and the degree of inequality constant, the commonly used CES utility functions with an elasticity of substitution below unity imply that in countries with high average ability levels there is much less labor supply, relative to countries with low average abilities, than is apparently observed. As a result, the tax base and revenue collected increase less than proportionally, so that it is not possible to sustain a scaled up tax system.

One approach to these issues is to consider the class of utility functions that yield the "scale" elasticity of zero.[5] As discussed by King, Plosser, and Rebelo (1982), this class has the form U(ln(*C*)+g(*L*)), where *C* is consumption and *L* is leisure. The motivation for examining this utility function is to ensure that simulations yield results that are not grossly inconsistent with the empirical observation that labor supply is broadly similar across countries with widely varying average income levels. Note, though, that the *optimal* tax system may not simply scale up, because the optimum also depends on the social welfare function. What the assumption about utility functions guarantees is that, *ceteris paribus*, the income elasticity of the optimal tax structure depends only on the social welfare function.

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[4] For a survey of the labor supply literature see Blundell and MaCurdy (1999).

In what follows, we present results for the Cobb-Douglas utility function. This is the only CES utility function that is also in the King-Plosser-Rebelo class. This choice implies a compensated elasticity of labor supply of one, which is high in the context of the literature on the elasticity of taxable income, but within the range of available estimates.

2.2.3 The Social Welfare Function

Although there have been attempts to recover a society's social welfare function (henceforth SWF) from examining actual government policies, or by examining individual risk aversion, for the most part economists have not tried to defend a particular SWF. Instead, they have investigated the implications of alternative specifications of the SWF for the solution to the problem at hand. We adopt that strategy as well.

To be consistent with the earlier literature, we investigate SWFs of the type introduced by Atkinson (1970), that are of the form $W = \Sigma(1\text{-}v)^{-1}U^{1-v}$. The higher the value of v, the larger is the concavity of the SWF, and the larger is the implied willingness of the society to trade off the sum of utilities for a more equal distribution of the utilities. We investigate the implications of three values of v: 0.5, 2.0, and 5.0, but concentrate on the case of v=2.0, which is Stern's (1976) central case, as well. Whatever value we choose, we assume it is the same for all countries and for the designer of the world income tax. In so doing, we skirt the fascinating but difficult question of whether the degree of egalitarianism differs across countries, including whether it differs systematically depending on the mean level of income or on the distribution of abilities.

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[5] Write leisure as $L(sw,sG)$ i.e., a function of wage rate and income, where s is a scalar. The necessary property for a zero scale elasticity is $dL/ds = 0$. Note that this property depends on a combination

2.3 Introducing Tradables and PPP Differences

In practice, there are significant differences in countries' real price levels. Ignoring these differences would have some peculiar implications when we allow for transfers across countries. The centralized budget constraint would simply add up nominal taxes and subsidies of different economies, so that it would amount to assuming that U.S. and Indian consumption can be exchanged one for one. While this may be correct for tradable commodities, it is not correct for the non-tradable ones. There are also implications for the location of production. Ignoring the presence of non-tradable commodities and holding price levels fixed while allowing for large international transfers will invariably lead to poor countries shutting down their production and relying solely on transfers. The prediction of 100% voluntary unemployment across the Third World would be a highly undesirable model feature.

In this section we enrich the model so as to address these issues in a more satisfactory way. The model features two sectors in each country that produce tradable and non-tradable commodities, denoted T and N, respectively. We normalize the (world) price of tradable goods to one. Non-tradable commodities are produced and consumed domestically. Because people want to consume both types of goods, some non-tradable goods have to be produced in each country. Equilibrium is reached by the adjustment of relative wages in the two sectors.[6] The details of the model follow.

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of income and price responses.

[6] An alternative equilibrating mechanism would allow the substitution of labor for capital. We do not, however, consider this to be a realistic possibility. For example, we are not aware of a conceivable way of substituting capital for the time of a barber. This example captures an important feature of at least some non-tradable commodities: they require the time of an individual. In other words, highly-skilled individuals are not more productive (or at least they are not much more productive) than the low-skilled ones.

2.3.1 Individuals

Assume that there is a continuum of individuals characterized by (heterogeneous) skill levels a. We consider the following utility function $u(T,N,L)=\left[(1-\alpha)\left(T^{\delta}N^{1-\delta}\right)^{-r}+\alpha L^{-r}\right]^{-1/r}$. This utility function is CES between leisure and consumption commodities. The Cobb-Douglas consumption segment implies that the fraction δ of total income is spent on tradables, while the rest is spent on non-tradables. Denoting the price of non-tradables in country i as p_i, consumption of the two types of goods is therefore given by

$$T^{D}=\delta\left(G+(1-t)w(a)(1-L)\right), \qquad N^{D}=\frac{1-\delta}{p_i}\left(G+(1-t)w(a)(1-L)\right),$$

where $w(a)$ is the wage rate of an individual with the skill level of a.

2.3.2 Production

We assume that production in both sectors takes place using only labor. However, the relative productivity of workers with different skill levels varies by sector. Each individual works in just one sector. More specifically, we assume that production in the tradable sector takes place using efficiency units of labor, such that

$$T^{s}=\int_{S_T} a\left(1-L(a)\right)dF(a),$$

where the integration takes place over the set of workers who choose to work in the tradable sector, S_T. The productivity of a worker in the non-tradable sector is assumed to be more closely related to the amount of time that is invested in the activity, although it is positively correlated with skill. In particular, we assume that the productivity in the non-tradable sector is a^{d}, where $0\le d<1$, so that

$$N^s = \int_{S_N} a^d \left(1 - L(a)\right) dF(a),$$

where S_N is the set of workers that choose to work in the non-tradable sector. In the extreme case when $d = 0$, each individual is equally productive in the non-tradable sector. In general, more skilled individuals are more productive in the non-tradable sector, but by a smaller (and decreasing) factor than in the tradable sector. There are no country-specific productivity differentials other than differences in the skill levels of individuals.

2.3.3 Equilibrium

We assume that both sectors are competitive. Because the tradable good is the numeraire, the individual who chooses to work in the tradable sector will receive a wage rate equal to a per unit of his time. The individual who chooses to work in the non-tradable sector is paid $p_i a^d$. Thus,

$$w(a) = \begin{cases} a, & a > p_i a^d, \\ p_i a^d, & \text{otherwise.} \end{cases}$$

Because it is assumed that $d<1$, low-skilled workers will choose to work in the non-tradable sector and high-skilled workers will choose to work in the tradable sector, although the cutoff level of skill will differ from country to country and depend on the tax system in place.

2.3.4 Features of the equilibrium

The price of the non-tradable commodity determines the potential wages of every individual in each of the two sectors, which determines the sector in which individual is working and allows us to solve for individual consumption and labor decisions. Therefore, the price of non-tradables in a given country is sufficient to determine the aggregate demand and supply of non-tradables. In the equilibrium, the price adjusts to make them equal.[7] Total imports of tradables must be equal to the transfer to the country:

$$T^D - T^S = transfer\,,$$

because transfers can only take the form of tradables.

One feature of equilibrium is that richer economies have a higher price of non-tradable commodities, so that the overall price level in richer economies is higher. This is also a well-known property of actual relative price levels, remarked upon by Balassa (1964) and Samuelson (1964),[8] who suggest explanations that are in the same spirit as this model.

2.4 Calibration Methodology and Baseline Results

Table A-1 lists the key data all of the 118 countries we examine. The first column lists the population in 1999. Note that, although not all countries are considered in the simulations, the countries that are considered comprise about 93% of world population. Next, the table shows the mean per capita income, in PPP dollars, followed by the PPP deflator. The level of gross national product (GNP) per capita varies from a low of $414 (for Sierra Leone) to $38,247 (for Luxembourg). The next two columns present the Gini coefficients taken from World Bank (2000) or Deininger and Squire (1996), and the year for which the coefficient was calculated. There is significant variation in these coefficients, ranging as low as 0.19 for the Slovak Republic and exceeding 0.60 for Brazil, the Central African Republic, Gabon, Malawi and Sierra Leone. Although recall

[7] The level of inequality may affect the price level because it affects the relative supply of low and high skilled labor. Note also that 100% unemployment will not occur, because in this case no non-tradable goods would be produced.

[8] See Rogoff (1996) for a recent survey.

that the Gini coefficients are not directly comparable, the wide range strongly suggests that inequality varies greatly across countries.

We assume that the utility function is Cobb-Douglas (*r=0*). This leaves three world-wide parameters to be selected: δ, the share of tradables in consumption; *d*, the productivity parameter in the non-tradable sector; and α, the share of leisure. There are also two country-specific parameters: the extent of inequality and the average skill (*a*) level (the distribution of *a* is assumed to be log-normal). Finally, the calibration procedure requires that each country's revenue constraint is satisfied under the baseline tax system, adding the third country-specific requirement and pinning down the demogrant under the baseline tax system.

In calibrating the model, we seek to match actual data regarding economy-specific mean incomes, Gini coefficients, and PPP indices, plus an overall world-wide average labor supply of 0.25. We first assume a standardized tax system with *t*=0.3 in all countries. Then, given *d*, δ and α, we adjust the distribution of skills in each country to exactly match the empirical mean income and relevant Gini coefficient. This requires solving for an equilibrium at each step, and yields the price of non-tradables and consumption of the two types of commodities. Having this information for all countries makes it possible to compute the PPP indices.[9]

The next step is to select the values of *d*, δ, and α that generate average labor supply at the desired level and that minimize the sum of squared deviations of the

[9] We use the Eltetö-Köves-Szulc (EKS) method that was used to compute PPP in our data. See Hill (1997) for a discussion of purchasing power parity methods and the EKS formula (equation 50).

Table 1: Summary statistics about the baseline calibrated world economy, selected countries.

	Mean full time income	Mean Labor supply	Mean Consumption	Unemployment	Labor income Gini	Consumption Gini	Consumption Percentiles		
							5%	50%	95%
World	15,849	0.25	5,060	0%	0.72	0.68	609	1,814	27,860
United States	95,093	0.27	30,636	0%	0.41	0.29	17,692	21,206	70,711
Israel	55,230	0.27	17,458	0%	0.36	0.25	10,817	13,372	36,518
Poland	12,639	0.28	3,963	0%	0.33	0.23	2,538	3,157	7,896
Peru	7,278	0.26	2,391	0%	0.46	0.32	1,298	1,508	5,982
El Salvador	5,635	0.25	1,898	0%	0.52	0.36	960	1,142	5,077
Papua New Guinea	2,084	0.20	801	0%	0.73	0.51	304	410	2,143
India	1,319	0.25	449	0%	0.54	0.38	221	266	1,230
Kyrgyz Republic	934	0.27	300	0%	0.41	0.28	175	210	680
Ethiopia	289	0.24	100	0%	0.57	0.40	47	58	285

simulated PPP levels of 118 countries from their actual 1999 PPP price levels.[10] This procedure generates calibrated parameter values of δ=.79, d=.12, α=.63. These parameter values imply that almost 80% of income is spent on tradable commodities. Furthermore, the small value of d implies that the non-tradable sector has significant decreasing returns to scale in individual skills, so that it is quite close to relying on just the amount of time provided.[11]

Table 1 presents the results of the calibration exercise for a few selected countries, and in the top row the world average.[12] (Table A-2 in the appendix shows the results for all 118 countries in the simulation). The first column of Table 1 shows the average labor

[10] There are a few complications in implementing this method. Most importantly, it may not be possible to match the empirical Gini values even by choosing extreme values of the inequality of skills. To see this concern, consider the case when δ=0. In this situation, all individuals employed in the non-tradable sector have exactly the same wage rate and exactly the same income. Because a given fraction of income must be spent on the production of this sector, this requires a big enough fraction of population working in this sector. As the result, the combination of a relatively low value of δ and a relatively low value of d (i.e., a high share of non-tradables) makes the lower end of the distribution equal and large, therefore limiting the overall level of inequality. It turns out that there is a region of values of these parameters where the actual Gini coefficients for the most unequal countries may not be matched. It also turned out that the best choice of these parameters (i.e., the one that minimizes the deviations from the actual PPP levels) is on the boundary of this region (i.e., the country with the highest inequality level has an extreme inequality of skills). The parameters we use are almost on this boundary, but the results are not sensitive to shifting away from the boundary.

[11] With d=0, a^d=1, implying that skill would not matter at all in the non-tradable sector. As a result, only hours worked in that sector would determine its output.

income if everybody worked full-time (i.e., consumed no leisure at all). The following columns show the average labor supply, consumption, and unemployment rate. Unemployment in this model is voluntary, and is a result of the demogrant that implies that a certain degree of consumption is possible even with zero labor supply. Although the simulated unemployment rate is as high as 21% for a few of the most unequal economies (those with Gini coefficients exceeding 0.55; see Table A-2 in the appendix), in aggregate only a tiny fraction (less than 0.5%) of the world's population chooses not to work. Those that choose to be unemployed are at the bottom of the ability distribution in a given country. Because with a Cobb-Douglas utility function, richer economies are just scaled-up versions of poorer ones, the unemployment rate is simply a function of the degree of inequality in underlying abilities.

The next two columns show the Gini coefficients of pre-tax labor income and consumption in the baseline simulation. Note that, because of the redistributive nature of the baseline tax system, the former is always higher than the latter, with the difference between the two measures ranging between 5 and 25 points. In each case, the parameters have been selected so that the relevant one of these is equal to the empirical value from Table A-1. The Gini coefficient of consumption for the world as a whole is 0.68, while the Gini coefficient based on labor income is 0.72.

The final three columns show consumption levels at the 5th, 50th, and 95th percentiles of the distribution. Huge inequality of consumption is evident in the statistics for the world: median consumption is $1,814, while consumption at the 95th percentile is

[12] The world average is computed over all individuals, and is not equal to the unweighted average of the country averages.

$27,860. As Figures A-2 and A-3 show, the calibrated PPP indices quite closely match the actual ones, although this mostly reflects the fact that the dependence of the price level on income is well accounted for. In reality there is also significant variation in the price level conditional on income level, and this is not well explained by our model. There is a small variation of the price level conditional on income that is produced by our model (due to differences in inequality levels), but it is nowhere near what is observed in the data.

3 Results

We are now ready to calculate the optimal income tax systems, first for each country and then for the world income tax. Table 2 shows the results for a subset of countries; Table A-3 in the appendix gives the full set of results.

In the focal simulation we assume that the parameter of the Atkinson's welfare function is v=2.0.[13] The first and third columns of Table 2 show the parameters – marginal tax rate and demogrant – of the decentralized optimal linear income tax. The optimal marginal tax rates are monotonically related to the Gini coefficients shown in Table 1. Under the decentralized solution, the optimal marginal tax rate varies between 0.13 for the Slovak Republic and 0.82 for Gabon. The population-weighted-average marginal tax rate is 0.41.

[13] As we discuss later, the qualitative conclusions are robust to changes in this parameter.

Table 2: Comparison of the decentralized solution and the WIT

	Tax rate		Demogrant		Labor Gini[a]		Consump. Gini[a]		Mean labor supply		Mean consumption		Mean labor income		Unemployment		Transfer
	Dec.	WIT	Dec.	WIT	Dec.	WIT	Dec.	WIT	Dec.	WIT	Dec.	WIT	Dec.	WIT	Dec.	WIT	WIT
World	0.41	0.62	1,539	3,112	0.75	0.79	0.69	0.25	0.21	0.09	5,027	5,016	5,027	5,016	2%	15%	0.0
United States	0.36	0.62	10,373	3,112	0.43	0.44	0.28	0.35	0.25	0.29	29,058	15,072	29,058	31,504	0%	0%	-16,432.0
Israel	0.30	0.62	5,267	3,112	0.36	0.41	0.25	0.27	0.27	0.25	17,417	9,293	17,417	16,283	0%	0%	-6,989.7
Poland	0.28	0.62	1,127	3,112	0.32	0.45	0.23	0.08	0.28	0.08	4,041	3,737	4,041	1,646	0%	0%	2,090.2
Peru	0.40	0.62	876	3,112	0.50	0.53	0.30	0.07	0.22	0.06	2,179	3,557	2,179	1,172	0%	9%	2,384.3
El Salvador	0.45	0.62	751	3,112	0.57	0.57	0.31	0.07	0.19	0.05	1,660	3,522	1,660	1,081	0%	15%	2,441.2
Papua New Guinea	0.63	0.62	416	3,112	0.82	0.72	0.31	0.08	0.08	0.04	665	3,478	665	966	19%	40%	2,512.3
India	0.47	0.62	182	3,112	0.60	0.53	0.32	0.04	0.18	0.04	388	3,384	388	718	0%	23%	2,666.2
Kyrgyz Republic	0.35	0.62	101	3,112	0.42	0.41	0.27	0.03	0.25	0.04	286	3,381	286	710	0%	10%	2,671.0
Ethiopia	0.50	0.62	42	3,112	0.64	0.56	0.32	0.05	0.16	0.04	85	3,381	85	710	0%	27%	2,670.8

[a] Gini coefficients for the world are calculated using labor/consumption adjusted for purchasing power parity differences.

The second and fourth columns of Table 2 show the parameters of the optimal world income tax. The marginal tax rate is 0.62, substantially higher than the average under the decentralized solution, although smaller than the decentralized tax rates for a handful of the most unequal economies. The world income tax system also features a very significant demogrant of $3,112. This demogrant exceeds the actual per capita GNP for 73 countries. Note, however, that the aid from abroad backfires as well, because it takes the form of tradable commodities. As a result, the larger the aid, the lower the value of tradables in terms of non-tradables and the less effective is a dollar of transfers.

Because of the monotonic relationship between the Gini and optimal progressivity, the world income tax rate is higher than the rate for almost all countries in the world. For this reason, the deadweight loss is significantly higher than would occur under the decentralized systems. The ratio of deadweight loss to the amount of redistribution achieved is also higher than it need be under a decentralized redistribution scheme. To see why, consider the hypothetical situation where each country has the same Gini but differing levels of mean income, so that each country would on its own choose the same optimal marginal tax. Assume further that the marginal tax rate that the world planner would choose is the same, because (we assume) world inequality is approximately the same as in each country. Because each person faces the same marginal tax rate under the decentralized and world income tax systems, the deadweight loss in the two cases would also be identical. However, the world income tax system would accomplish much more redistribution, because it is not providing demogrants to people who are poor from a country's perspective but who are not poor from a world perspective.

The middle four columns of Table 2 show the Gini coefficients of consumption and labor income under the decentralized and world income tax regimes. Not surprisingly, the Gini coefficients of consumption are lower than those of labor income.[14] Redistributive tax systems render consumption considerably more equal.

A striking result of this simulation is that the decentralized tax system does not substantially affect the degree of inequality for the whole world. The Gini coefficient of consumption decreases only slightly when compared to the original calibrated world featured in Table 1.[15] In fact, if tax rates in all countries were set to zero, the Gini coefficient of consumption would be 0.695, compared to just 0.689 under the decentralized tax systems. Each country redistributing on its own makes only a small dent in world inequality. This result simply reflects that inequality in the distribution of all individuals' income, regardless of where in the world they live, is higher than the inequality of individuals' income within nearly every country of the world. According to Milanovic (1999), the differences in countries' mean income explain at least three-

[14] In most cases the Gini coefficient of consumption falls below the baseline values of Table 1, for both the decentralized and the world tax systems, with exceptions to this rule being the economies that optimally set taxes below the baseline value of t=0.3.

quarters of overall world inequality. No country on its own can transfer income from the world's rich to the world's poor, because no country has the world's poorest *and* the world's richest among its citizens. Consequently, decentralized redistribution cannot significantly address world's inequality.

The world income tax fares significantly better in reducing the inequality of consumption. The Gini coefficient goes from 0.69 under the decentralized tax regimes to 0.25 under the WIT, when calculated using consumption adjusted for the (endogenous) price level. However, because of its disincentive effects, the world income tax also decreases the average level of consumption and reduces average labor supply. Average labor supply (the number of hours worked) falls by more than half, from 0.21 to 0.09, under the world income tax. This decline is mostly due to the sharp decline in labor supply in the poor economies. The world unemployment rate increases from 2% to 15%.

Although by construction there are no cross-border transfers under the decentralized solution, under the world income tax the implicit transfers are substantial. For example, per capita the United States transfers $16,432 abroad. Countries at about the mean income of Uruguay and below receive net transfers, and the poorest countries receive more than $2,600 per capita. The mean level of welfare for the whole world[16] increases under the world income tax system when compared to the decentralized solution, implying that the world income tax is more successful in redistributing income than the decentralized system. Under the decentralized solution, the average welfare level

[15] This is possible because for many richer economies our baseline tax rate of 0.3 exceeds the optimal marginal tax rate, and therefore for these countries there is more redistribution in the baseline case than under the optimal income tax structure.

[16] The welfare levels are normalized for expositional purposes. Only relative differences are of interest.

Table 3: Comparison of the decentralized solution and the WIT: Further details

	Average non-tradable consumption		Price of non-tradables		PPP		Consumption Percentiles [a]						Average welfare	
							5%		50%		95%			
	Dec.	WIT	Dec.	WIT	Dec.	WIT	Dec.	WIT	Dec.	WIT	Dec.	WIT	Dec.	WIT
World	0.22	0.13	3,371	7,687			566	4,962	1,599	6,198	28,784	14,043	-7,564,213	-4,384,246
United States	0.35	0.25	17,525	12,467	1.00	1.00	17,373	6,835	20,198	10,808	65,683	37,657	-2,698,305	-3,608,738
Israel	0.34	0.21	10,858	9,250	0.85	0.90	10,812	5,260	13,346	7,353	36,416	19,906	-3,180,572	-3,932,527
Poland	0.28	0.14	2,992	5,578	0.57	0.69	2,566	3,261	3,216	3,531	8,097	5,195	-4,961,715	-4,422,498
Peru	0.25	0.13	1,869	5,883	0.50	0.70	1,272	3,112	1,465	3,431	5,207	4,252	-5,846,696	-4,458,642
El Salvador	0.22	0.12	1,587	6,105	0.48	0.71	955	3,112	1,120	3,399	4,082	3,945	-6,288,349	-4,474,412
Papua New Guinea	0.12	0.10	1,198	7,525	0.44	0.82	416	3,112	480	3,233	1,251	4,256	-8,109,220	-4,549,222
India	0.18	0.10	456	7,100	0.33	0.78	222	3,112	263	3,327	963	3,892	-9,720,412	-4,542,144
Kyrgyz Republic	0.20	0.10	299	7,191	0.29	0.79	172	3,112	201	3,362	635	3,734	-10,884,054	-4,549,296
Ethiopia	0.14	0.08	127	8,589	0.22	0.91	49	3,112	58	3,311	212	3,934	-15,303,253	-4,609,515

[a] Consumption percentiles for the world are calculated using consumption adjusted for purchasing parity differences.

in the world is about equal to that of the average Filipino. A conversion to the world income tax brings it to about the level of a typical Czech. Not surprisingly, there are huge welfare gains for residents of the poor countries and substantial welfare losses for residents of the developed economies.

Figure 1 illustrates the implications of switching from decentralized income tax systems to a world income tax by plotting tax as a function of gross income for individuals at the 5th, 50th, and 95th percentiles (under the decentralized system) for three countries: India, Poland, and the United States. For the citizens of the United States, tax due under the world income tax exceeds tax liability under the decentralized tax system for any level of gross income. This is also true for the richest Poles, but most Poles would observe a decrease in tax liability, absent behavioral response. Even the richest Indians gain, although not as much as the poorest ones. The figure also shows that the marginal tax rate increases under the WIT for all three economies. As a result, within each country the richest citizens gain least (or lose most).

The value of the substantial cross-country transfers (for example, citizens of India receive on average a nominal transfer of $2,666) may seem to be magnified by differences in the cost of living in different economies. For example, under the decentralized solution the purchasing power of a dollar in India is magnified by a factor of more than three. However, transfers may take the form of tradables only, so that they are not as beneficial as a pure income transfer would be. This is reflected in significant changes in the cost of living of the poorest economies, which reflect the increased prices of non-tradables. This occurs because, as an economy becomes richer (due to transfers), the demand for non-tradables increases, but their supply is still bounded by the economy's own labor resources. In the case of India, the price of non-tradables under the WIT increases by a factor of twenty, and the overall cost of living increases from 0.33 to 0.78 (Table 3). In fact, one result of this transfer scheme is that most of the poorest economies end up consuming less non-tradable goods. This is because there is an overall decrease in labor supply as the result of the large transfer.

The differences in the cost of living also make it possible for average consumption in the world to stay almost constant in PPP terms. Looking at the percentiles of consumption, it is clear that under the world income tax most of the population gains. The consumption level of the world-median individual increases by $4,600 in PPP terms. At the same time, the structure of consumption changes. Consumption of non-tradables falls in every country.

4 Foreign Aid and the Bono/O'Neill Factor

A striking feature of the optimal world income tax solution is the large transfers from the rich countries, amounting in the United States to $16,432 per capita. In fact, many relatively well-off countries do provide foreign aid to less well-off countries, and most rich countries contribute to multilateral institutions such as the World Bank that offer assistance to relatively poor countries. How does it compare to our simulated level of optimal transfers, and what does the comparison imply?

4.1 Foreign Aid

The Development Assistance Committee (DAC) of the OECD publishes annual data on both bilateral and multilateral aid flows.[17] Its 1999 report indicates that in 1998 the U.S. gave $5.988 billion of bilateral assistance, and $2.798 billion of multilateral assistance, for a total of $8.786 billion of official development assistance. This last figure represents 0.10% of U.S. GNP, and is $33 per capita. To put the U.S. figures in perspective, for all 21 DAC countries (including the U.S.), official development assistance represented 0.24% of GNP; the U.S. ranks 21st among the 21 countries represented. The actual amount of net aid contributed or received by various countries, from World Bank (2000, Tables 6.8 and 6.10), is presented in the last column of Table A-1.[18]

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[17] There is a considerable literature on the determinants of foreign aid, in particular the extent to which it is motivated by strategic and political considerations as opposed to altruistic and humane ones. Lumsdaine (1997) investigates the effect of colonial links between donor and recipient, the democratic status of the recipients, and the income level of the recipient, but presents only simple correlations rather than a full-blown multivariate analysis. Alesina and Dollar (1998) do perform such an analysis (of bilateral aid flows only), and find considerable evidence that the direction of foreign aid is indeed dictated by political and strategic considerations much more than by either the economic needs or the policy performance of the recipient.

A separate but relevant literature concerns the effects of foreign aid on the receiving countries, and has been studied by Jepma (1997) and Boone (1994, 1996). Most recently, Burnside and Dollar (2000) find that aid is beneficial to countries that adopt appropriate and stable policies, and is wasted otherwise. However, they find no evidence that foreign aid encourages the adoption of "good" macroeconomic policies.

[18] Table 6.8 of World Bank (2000) reveals the official development assistance and aid contributions of the high-income economies in 1998. It includes both bilateral transfers and contributions to the financial institutions. Table 6.10 shows the amount of assistance and aid received by various countries. These numbers do not balance out. This is because some aid is allocated by region, but not by country, and because of administrative costs, research into development issues, and aid to non-governmental

4.2 Bono and O'Neill: Estimating the Implicit Discounting of Foreigners' Well-being and/or the Implicit Extent of Waste

The actual flows of aid are miniscule compared to what our simulated world income tax generates. The discrepancy cannot be explained by the efficiency costs that would result from the higher marginal tax rates needed to generate the tax revenue to be transferred from the poor countries—that is an integral part of the WIT simulations. One natural explanation for the discrepancy is that, contrary to the model's assumption, Americans are not border-neutral at all, but rather value the welfare of a foreigner significantly less than the welfare of an American. Another is that transfers are not used efficiently, so that the richer countries perceive them as a waste of resources.

The notion that Americans' altruism stops, or nearly stops, at the border will not shock most readers. Neither will the possibility that transfers are wasted. With the model we have developed, though, we can go beyond suggesting these notions to quantify what the actual flows of aid imply about how much the United States weighs the well-being of a resident of, say, India. Our weights reflect a combination of a lower weight put on foreigners' well-being and the extent of waste. Our preferred interpretation of them is as a measure of the extent to which transfers are wasted that must be implicitly subscribed to if the United States weights citizens of a given country as Americans and yet chooses not to provide substantial aid.

To fix ideas, consider a simple version of this setup in which the U.S. and India are the only countries in the world, and each country has only a poor person (denoted P) and a rich person (denoted R). Each country makes its own decisions about its tax-and-

organizations. As the result, contributions exceed aid received by approximately $22 billion. The total transfer system. The social welfare function of the U.S. includes the utility level of Indians, although the Indians' utilities may have a relative weight of less than one. The social welfare function of the U.S. has the form $W = (1-v)^{-1}\left[U_{RS}^{1-v} + U_{PS}^{1-v} + bU_{RI}^{1-v} + bU_{PI}^{1-v}\right]$, where U_{ij} refers to the utility of the i^{th} person in the j^{th} country (S=US and I=India), and b ($0<b$) is the relative weight placed on an Indian's utility.

The United States now has three policy instruments: the demogrant and income tax rate as before, plus a transfer to the Indian government. The U.S. knows the Indian social welfare function, so it knows exactly how India will adjust its own demogrant and tax rate upon receipt of a transfer, and can therefore calculate the increase in the utility of each Indian citizen. Given these assumptions, we can in the framework of our simulated model calculate the amount of transfer to India the U.S. will make for any value of *b*. Conversely, we can work backwards and calculate what value of *b* is consistent with the amount of transfers we observe. In what follows we do the latter. Before we do so, we introduce the possibility that transfers are wasted. Specifically, we assume that a transfer from the U.S. to any other country need not go toward reducing that country's revenue requirement but instead it can be wasted by corrupt politicians, whose welfare we assign a zero weight. We denote the extent of this waste in country *i* by a^i, so that a transfer of T results in a decrease of the revenue requirement by $(1-a^i)$T.

amount of aid received is about $35 billion.

Table 4: Implied U.S. Weights

	Decentralized solution	WIT
World	0.1591	0.3795
United States	1.0000	1.0000
France	0.8188	0.9051
Israel	0.5284	0.6618
Poland	0.0802	0.2933
Peru	0.0336	0.2771
El Salvador	0.0233	0.2725
Papua New Guinea	0.0071	0.2524
India	0.0035	0.2609
Kyrgyz Republic	0.0024	0.2636
Ethiopia	0.0005	0.2557

Calculating the implied weights on the well-being of other countries' residents is straightforward, as long as each country selects its tax system optimally. Denote by λ^i the marginal social welfare benefit from a marginal increase in public spending in country *i*. Formally, this is the Lagrange multiplier on the revenue constraint in the i^{th} country's optimal tax problem.[19] Because of the possibility of waste, the marginal welfare from transfer of a dollar to country *i* is then $(1\text{-}a^i)\lambda^i$. On the margin, the optimizing government considering international aid compares its own λ to that of other countries. At the optimum, the government of donor country *i* must then set $\lambda^i=(1\text{-}a^j)b^j\lambda^j$, for any recipient country *j*, where b^j is the welfare weight attached to country *j*. This formula allows us to calculate the product $(1\text{-}a^j)b^j$ directly, because optimization yields the values of the λ's. In the case of the model of Section 2, we additionally adjust this formula for differences in the cost of living, so that $b^j=p^{ij}\lambda^i/\lambda^j$, where p^{ij} is the index of cost of living in country *j* relative to country *i*.

[19] At the optimum, it is equal to the average of marginal utilities of income (from the social welfare point of view) in a given country.

Table 4 presents the implied marginal weights from the point of view of the U.S. for a selected group of countries. By construction, *ceteris paribus*, weights for the poorer economies must be smaller than those for the richer ones. For the poorest economy of Ethiopia, this weight is just 0.0005. One blunt interpretation is that the latter number implies that the amount of actual foreign aid given by the U.S. to Ethiopia is consistent with the well-being of an Ethiopia resident being valued at 1/2000 of that of an American. Alternatively, it can be believed that only $1/20^{th}$ of one percent of aid reaches its desired recipients. A combination of the two is also possible. For example, if as much as 5% of aid reaches its recipients, the corresponding welfare weight consistent with the observed amount of aid would still be equal to just 0.01.

The column labeled WIT in Table 4 reveals that even under an optimal world income tax there is still room for a potential welfare improvement: the average weight for the rest of the world is 0.4, so that a marginal dollar in U.S. transfers would still finance a $2.50 increase in welfare, if used to finance a universal increase in the demogrant. This is, however, not feasible in our model because of the assumed linearity of the tax system that precludes a unilateral change of the U.S. transfers.[20]

5 Sensitivity Analyses

In Table 5, we present the results of simulations analogous to those of Section 3, but for different degrees of concavity of the common social welfare function. We consider v=0.5, 2.0 and 5.0. Because v=2.0 is our baseline case, the numbers in this part

[20] In a more general nonlinear tax system the feasibility of such transfers would be limited by the incentive constraints.

Table 5: Sensitivity analysis

	Marginal tax		Demogrant		Transfer	PPP		Consumption Percentiles						Marginal welfare	
								5%		50%		95%			
	Dec.	WIT	Dec.	WIT	WIT	Dec.	WIT	Dec.	WIT	Dec.	WIT	Dec.	WIT	Dec.	WIT
v=0.5															
World	0.36	0.60	1,329	3,061	0.0			574	5,046	1,677	6,292	29,970	14,595	0.1982	0.4266
United States	0.30	0.60	9,244	3,061	-16,155.7	1.00	1.00	17,691	7,077	21,167	11,203	70,509	39,202	1.0000	1.0000
Poland	0.21	0.60	913	3,061	2,010.4	0.57	0.68	2,641	3,243	3,390	3,513	8,714	5,349	0.2018	0.3506
India	0.43	0.60	172	3,061	2,632.5	0.33	0.76	223	3,061	265	3,288	1,031	3,848	0.0235	0.3201
v=2.0															
World	0.41	0.62	1,539	3,112	0.0			566	4,962	1,599	6,198	28,784	14,043	0.1591	0.3795
United States	0.36	0.62	10,373	3,112	-16,432.0	1.00	1.00	17,373	6,835	20,198	10,808	65,683	37,657	1.0000	1.0000
Poland	0.28	0.62	1,127	3,112	2,090.2	0.57	0.69	2,566	3,261	3,216	3,531	8,097	5,195	0.0802	0.2933
India	0.47	0.62	182	3,112	2,666.2	0.33	0.78	222	3,112	263	3,327	963	3,892	0.0035	0.2609
v=5.0															
World	0.45	0.64	1,722	3,162	0.0			561	4,864	1,527	6,081	27,408	13,433	0.1385	0.3273
United States	0.41	0.64	11,252	3,162	-16,713.8	1.00	1.00	17,014	6,570	19,233	10,375	61,132	35,966	1.0000	1.0000
Poland	0.33	0.64	1,280	3,162	2,174.2	0.57	0.70	2,493	3,277	3,060	3,548	7,572	5,024	0.0129	0.2245
India	0.51	0.64	189	3,162	2,699.5	0.34	0.80	221	3,162	261	3,363	905	3,933	0.0001	0.1883

repeat information shown earlier. A value of v=5.0 corresponds to a much more egalitarian social welfare function, while v=0.5 is a much less egalitarian social welfare function. To save space, we show only the results for the world as a whole and three different countries: the United States, Poland and India. As expected, increasing egalitarianism leads to more redistribution: marginal tax rates increase under both the decentralized and world income tax solutions. Notably, though, the changes are much larger in the decentralized case. This is because world inequality is very extreme to begin with, and therefore even a low redistributive incentive induces high marginal tax rates (and the optimal marginal tax rate is bounded from above by the one corresponding to the "peak" of the Laffer curve). Indeed, the optimal world income tax is almost unaffected by changes in the concavity of the welfare function.

Changes in the social welfare function also have significant consequences for the implied weights. This is intuitive. Without any redistributive incentive, these weights would all be equal to one even if the distribution of incomes were very unequal. Therefore, the lower is the concavity of the social welfare function, the higher should be these weights. For example, when v=0.5, the implied welfare weight attached by the U.S. to an Indian is 0.32, and it falls to 0.19 for v=5.0.

6 Summary and Ruminations

The decentralization of redistribution decisions results in vastly less redistribution than would a centralized world income tax, even if the world policy maker considers the disincentive effects caused by the higher taxes needed for cross-country transfers. In our stylized simulation of redistribution policy, the decentralized system hardly budges the world Gini coefficient of consumption, even though it reduces it for particular countries. Put bluntly, within-country redistributive schemes are of almost no value from the world perspective. In contrast, a world income tax would provide a drastic reduction in consumption inequality, cutting the Gini coefficient by nearly two-thirds. The decentralized scheme is also relatively inefficient, as it causes an efficiency loss that is larger than it need be to achieve the same amount of redistribution as would a centralized system. To be sure, the world income tax features a much higher absolute efficiency cost, because it has a higher marginal tax rate than most countries would choose on their own.

The actual flow of foreign aid is minuscule compared to what the optimal world income tax implies, suggesting that the social policies of the rich countries are not border-neutral, or anything close to that. In our baseline case, we calculate that this level of transfer is consistent with the U.S. on average valuing the well-being of foreigners only 1/6ths as much as an American citizen, and less than 1/2000th for poorest of the developing economies. Alternatively, it corresponds to an extreme extent of waste so that only 1/20th of one percent of transfers reaches its desired recipients.

This conclusion is sensitive to the assumed concavity of the social welfare function. Furthermore, our interpretation of weights is subject to a number of caveats. The first is due to the restrictiveness of the instruments that we consider: a linear tax does not allow the targeting of aid directly to the poorest members of the poor economies. If more targeted ways of transferring aid were available, the implied weights consistent with actual transfers would be even lower. We consider only a static framework and do not account for the effect that transfers can have on human or physical capital accumulation and, therefore, on future growth. Finally, it would certainly be interesting to credibly distinguish ethnocentrism from perceived inefficiencies.

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Table A-1: Data

	Country	Population	GNP	GNP (PPP)	PPP deflator	Gini	Year of Gini	Net aid
1	Luxembourg	432	44,640	38,247	1.167	26.90	1994 [g]	-115
2	Switzerland	7,120	38,350	27,486	1.395	33.10	1992 [g]	-974
3	Norway	4,454	32,880	26,522	1.240	25.80	1995 [g]	-1373
4	Japan	126,570	32,230	24,041	1.341	24.90	1993 [g]	-10772
5	Denmark	5,317	32,030	24,280	1.319	24.70	1992 [g]	-1822
6	United States	272,878	30,600	30,600	1.000	40.80	1997 [g]	-11512
7	Singapore	3,223	29,610	27,024	1.096	39.00	1989 [g,d]	2
8	Austria	8,086	25,970	23,808	1.091	23.10	1987 [g]	-647
9	Germany	82,027	25,350	22,404	1.131	30.00	1994 [g]	-6235
10	Sweden	8,857	25,040	20,824	1.202	25.00	1992 [g]	-1678
11	Belgium	10,223	24,510	24,200	1.013	25.00	1992 [g]	-951
12	Netherlands	15,802	24,320	23,052	1.055	32.60	1994 [g]	-3172
13	Finland	5,167	23,780	21,209	1.121	25.60	1991 [g]	-478
14	Hong Kong	6,877	23,520	20,939	1.123	45.00	1991 [g,d]	7
15	France	60,794	23,480	21,897	1.072	32.70	1995 [g]	-6565
16	United Kingdom	59,110	22,640	20,883	1.084	36.10	1991 [g]	-4299
17	Australia	18,994	20,050	22,448	0.893	35.20	1994 [g]	-961
18	Italy	57,649	19,710	20,751	0.950	27.30	1995 [g]	-2521
19	Canada	30,604	19,320	23,725	0.814	31.50	1994 [g]	-1848
20	Ireland	3,727	19,160	19,180	0.999	35.90	1987 [g]	-199
21	Israel	6,093	17,450	16,867	1.035	35.50	1992 [g]	1066
22	Spain	39,410	14,000	16,730	0.837	32.50	1990 [g]	-1381
23	New Zealand	3,823	13,780	16,566	0.832	43.90	1993 [g]	-130
24	Greece	10,536	11,770	14,595	0.806	32.70	1993 [g]	-179
25	Portugal	9,990	10,600	15,147	0.700	35.60	1994-95 [g]	-279
26	Slovenia	1,981	9,890	15,062	0.657	26.80	1995 [g]	40
27	Korea Republic	46,848	8,490	14,637	0.580	31.60	1993 [c]	-50
28	Uruguay	3,312	5,900	8,280	0.713	42.30	1989 [g]	24
29	Czech Republic	10,280	5,060	12,289	0.412	25.40	1996 [g]	447
30	Chile	15,018	4,740	8,370	0.566	56.50	1994 [g]	105
31	Hungary	10,068	4,650	10,479	0.444	30.80	1996 [g]	209
32	Croatia	4,464	4,580	6,915	0.662	26.80	1998 [c]	39
33	Brazil	168,066	4,420	6,317	0.700	60.00	1996 [g]	329
34	Mexico	97,425	4,400	7,719	0.570	53.70	1995 [g]	15
35	Trinidad and Tobago	1,293	4,390	7,262	0.605	40.30	1992 [g]	14
36	Poland	38,695	3,960	7,894	0.502	32.90	1996 [g]	902
37	Venezuela	23,707	3,670	5,268	0.697	48.80	1996 [g]	37
38	Slovak Republic	5,396	3,590	9,811	0.366	19.50	1992 [g]	155
39	Mauritius	1,170	3,590	8,652	0.415	36.69	1991 [c,d]	40
40	Estonia	1,442	3,480	7,826	0.445	35.40	1995 [g]	90
41	Malaysia	22,710	3,400	7,963	0.427	48.50	1995 [g]	202
42	Gabon	1,208	3,350	5,325	0.629	63.18	1977 [c,d]	45
43	Botswana	1,588	3,240	6,032	0.537	54.21	1986 [c,d]	106
44	South Africa	21,429	3,160	8,318	0.380	59.30	1993-94 [c]	512
45	Panama	2,808	3,070	5,016	0.612	48.50	1997 [c]	22
46	Turkey	64,328	2,900	6,126	0.473	41.50	1994 [c]	14
47	Costa Rica	3,588	2,740	5,770	0.475	47.00	1996 [g]	27
48	Belarus	10,208	2,630	6,518	0.403	21.70	1998 [c]	28
49	Lithuania	3,699	2,620	6,093	0.430	32.40	1996 [c]	128
50	Latvia	2,430	2,470	5,938	0.416	32.40	1998 [g]	97
51	Peru	25,230	2,390	4,387	0.545	46.20	1996 [g]	501
52	Jamaica	2,598	2,330	3,276	0.711	36.40	1996 [c]	18
53	Russian Federation	146,512	2,270	6,339	0.358	48.70	1998 [c]	1017
54	Colombia	41,539	2,250	5,709	0.394	57.10	1996 [g]	166
55	Tunisia	9,457	2,100	5,478	0.383	40.20	1990 [c]	148
56	Thailand	61,691	1,960	5,599	0.350	41.40	1998 [c]	690
57	Dominican Republic	8,404	1,910	4,653	0.410	48.70	1996 [g]	120
58	El Salvador	6,189	1,900	4,048	0.469	52.30	1996 [g]	180
59	Iran	62,977	1,760	5,163	0.341	42.90	1984 [c]	164
60	Guatemala	11,086	1,660	3,517	0.472	59.60	1989 [g]	233
61	Paraguay	5,359	1,580	4,193	0.377	59.10	1995 [g]	76
62	Algeria	29,950	1,550	4,753	0.326	35.30	1995 [c]	389

Table A-1: Data

	Country	Population	GNP	GNP (PPP)	PPP deflator	Gini	Year of Gini	Net aid
63	Romania	22,458	1,520	5,647	0.269	28.20	1994 [g]	356
64	Jordan	4,693	1,500	3,542	0.423	36.40	1997 [c]	408
65	Egypt	62,430	1,400	3,303	0.424	28.90	1995 [c]	1915
66	Bulgaria	8,216	1,380	4,914	0.281	28.30	1995 [c]	232
67	Ecuador	12,409	1,310	2,605	0.503	43.70	1995 [c]	176
68	Kazakhstan	15,438	1,230	4,408	0.279	35.40	1996 [c]	207
69	Morocco	28,238	1,200	3,190	0.376	39.50	1998-99 [c]	528
70	Philippines	76,785	1,020	3,815	0.267	46.20	1997 [c]	607
71	Bolivia	8,135	1,010	2,193	0.461	42.00	1990 [g]	628
72	Sri Lanka	18,985	820	3,056	0.268	34.40	1995 [c]	490
73	Papua New Guinea	4,705	800	2,263	0.354	50.90	1996 [c]	361
74	China	1,249,671	780	3,291	0.237	40.30	1998 [g]	2359
75	Honduras	6,325	760	2,254	0.337	53.70	1996 [g]	318
76	Ukraine	49,908	750	3,142	0.239	32.50	1996 [c]	380
77	Uzbekistan	24,600	720	2,092	0.344	33.30	1993 [g]	144
78	Cote d'Ivoire	14,729	710	1,546	0.459	36.70	1995 [c]	798
79	Turkmenistan	4,779	660	3,099	0.213	40.80	1998 [c]	17
80	Cameroon	14,691	580	1,444	0.402	49.00	1983 [c,d]	424
81	Indonesia	207,022	580	2,439	0.238	36.50	1996 [g]	1258
82	Lesotho	2,105	550	2,058	0.267	56.00	1986-87 [c]	66
83	Zimbabwe	11,904	520	2,470	0.211	56.80	1990-91 [c]	280
84	Guinea	7,247	510	1,761	0.290	40.30	1994 [c]	359
85	Senegal	9,285	510	1,341	0.380	41.30	1995 [c]	502
86	Armenia	3,809	490	2,210	0.222	39.39	1989 [g,d]	138
87	Pakistan	134,790	470	1,757	0.268	31.20	1996-97 [c]	1050
88	India	997,515	450	2,149	0.209	37.80	1997 [c]	1595
89	Nicaragua	4,919	430	2,154	0.200	50.30	1991 [c]	562
90	Ghana	18,949	390	1,793	0.218	32.70	1997 [c]	701
91	Mauritania	2,598	380	1,522	0.250	38.90	1995 [c]	171
92	Vietnam	77,515	370	1,755	0.211	36.10	1998 [c]	1163
93	Bangladesh	127,669	370	1,475	0.251	33.60	1995-96 [c]	1251
94	Moldova	4,281	370	2,358	0.157	34.40	1992 [g]	33
95	Kenya	29,410	360	975	0.369	44.50	1994 [c]	474
96	Yemen	17,048	350	688	0.509	39.50	1992 [c]	310
97	Mongolia	2,623	350	1,496	0.234	33.20	1995 [c]	203
98	Gambia	1,251	340	1,492	0.228	47.80	1992 [c]	38
99	Sudan	28,993	330	1,298	0.254	38.72	1968 [g,d]	209
100	Uganda	21,479	320	1,136	0.282	39.20	1992-93 [c]	471
101	Zambia	9,881	320	686	0.466	49.80	1996 [c]	349
102	Nigeria	123,897	310	744	0.417	50.60	1996-97 [c]	204
103	Kyrgyz Republic	4,744	300	2,223	0.135	40.50	1997 [g]	216
104	Central African Republic	3,540	290	1,131	0.256	61.30	1993 [c]	120
105	Lao PDR	5,097	280	1,726	0.162	30.40	1992 [c]	281
106	Cambodia	11,757	260	1,286	0.202	40.40	1997 [c]	337
107	Madagascar	15,051	250	766	0.326	46.00	1993 [c]	494
108	Tanzania	32,923	240	478	0.502	38.20	1993 [c]	998
109	Mali	10,911	240	693	0.346	50.50	1994 [c]	349
110	Burkina Faso	10,996	240	898	0.267	48.20	1994 [c]	397
111	Mozambique	17,264	230	797	0.289	39.60	1996-97 [c]	1039
112	Nepal	23,384	220	1,219	0.180	36.70	1995-96 [c]	404
113	Malawi	10,788	190	581	0.327	62.00	1993 [c,d]	434
114	Niger	10,493	190	727	0.261	50.50	1995 [c]	291
115	Guinea-Bissau	1,185	160	595	0.269	56.20	1991 [c]	96
116	Sierra Leone	4,949	130	414	0.314	62.90	1989 [c]	106
117	Burundi	6,678	120	553	0.217	33.30	1992 [c]	77
118	Ethiopia	62,782	100	599	0.167	40.00	1991 [c]	648

[c] Gini coefficient based on consumption or net income data.

[g] Gini coefficient based on gross income data.

[d] Value of Gini from Deininger and Squire (1996).

Population in thousands, GNP in PPP dollars per capita, net aid in billions of nominal dollars.

Table A-2 - Baseline Tax System - Decentralized 30% Income Tax

	Average full time income	Average Labor Supply	GNP Consump.	Unemp-loyment	Labor income Gini	Consumption Gini	Consump. Percentiles 5%	50%	95%	Non-Tradables Average	Price	PPP index
World	15,849	0.25	5,060	0%	0.72	0.68	609	1,814	27,860	0.27	3,191	
1	144,746	0.28	44,631	0%	0.27	0.19	30,823	38,251	78,910	0.35	26,801	1.19
2	122,228	0.28	38,344	0%	0.33	0.23	24,502	30,469	76,653	0.36	22,137	1.11
3	106,970	0.28	32,887	0%	0.26	0.18	23,051	28,522	56,888	0.33	20,712	1.08
4	105,064	0.28	32,239	0%	0.25	0.18	22,804	28,174	54,951	0.33	20,503	1.07
5	104,411	0.28	32,025	0%	0.25	0.17	22,711	28,038	54,382	0.33	20,426	1.07
6	95,093	0.27	30,636	0%	0.41	0.29	17,692	21,206	70,711	0.38	17,003	1.00
7	92,632	0.27	29,618	0%	0.39	0.27	17,592	21,404	65,849	0.37	16,792	1.00
8	85,043	0.28	25,975	0%	0.23	0.16	18,830	23,112	42,639	0.32	17,283	1.01
9	81,421	0.28	25,332	0%	0.30	0.21	16,776	20,888	47,722	0.34	15,779	0.97
10	81,572	0.28	25,030	0%	0.25	0.18	17,705	21,896	42,838	0.32	16,409	0.99
11	79,891	0.28	24,515	0%	0.25	0.18	17,340	21,445	41,955	0.32	16,112	0.98
12	77,597	0.28	24,320	0%	0.33	0.23	15,614	19,420	48,292	0.34	14,881	0.95
13	77,365	0.28	23,775	0%	0.26	0.18	16,699	20,658	40,974	0.32	15,600	0.97
14	71,956	0.26	23,516	0%	0.45	0.32	12,961	15,008	57,210	0.38	13,111	0.91
15	74,897	0.28	23,474	0%	0.33	0.23	15,062	18,719	46,352	0.34	14,424	0.94
16	71,524	0.27	22,672	0%	0.36	0.26	13,889	17,100	47,868	0.35	13,548	0.92
17	63,482	0.27	20,044	0%	0.35	0.25	12,475	15,415	41,408	0.34	12,282	0.89
18	63,872	0.28	19,713	0%	0.27	0.19	13,556	16,845	35,265	0.32	13,010	0.91
19	61,815	0.28	19,312	0%	0.32	0.22	12,566	15,649	37,582	0.33	12,265	0.89
20	60,547	0.27	19,161	0%	0.36	0.25	11,823	14,595	40,332	0.34	11,736	0.87
21	55,230	0.27	17,458	0%	0.36	0.25	10,817	13,372	36,518	0.34	10,842	0.85
22	44,705	0.28	14,003	0%	0.33	0.23	9,005	11,195	27,561	0.32	9,169	0.80
23	42,361	0.26	13,783	0%	0.44	0.31	7,711	9,042	33,213	0.35	8,259	0.77
24	37,534	0.28	11,764	0%	0.33	0.23	7,548	9,381	23,229	0.31	7,854	0.76
25	33,545	0.27	10,603	0%	0.36	0.25	6,570	8,122	22,180	0.32	6,991	0.73
26	32,091	0.28	9,895	0%	0.27	0.19	6,833	8,489	17,572	0.29	7,119	0.74
27	26,006	0.26	8,488	0%	0.45	0.31	4,701	5,468	20,549	0.33	5,360	0.67
28	18,240	0.26	5,906	0%	0.43	0.30	3,358	3,985	13,932	0.31	3,955	0.61
29	16,483	0.28	5,063	0%	0.25	0.18	3,565	4,408	8,693	0.27	4,007	0.61
30	13,744	0.24	4,737	0%	0.57	0.40	2,262	2,752	13,275	0.33	3,009	0.56
31	14,923	0.28	4,653	0%	0.31	0.22	3,055	3,806	8,931	0.28	3,529	0.59
32	14,360	0.27	4,570	0%	0.38	0.26	2,761	3,383	9,921	0.29	3,278	0.58
33	12,588	0.24	4,422	0%	0.60	0.42	2,023	2,501	12,682	0.33	2,800	0.55
34	12,957	0.25	4,400	0%	0.54	0.38	2,178	2,613	11,996	0.32	2,853	0.55
35	13,678	0.27	4,394	0%	0.40	0.28	2,566	3,096	9,998	0.30	3,098	0.57
36	12,639	0.28	3,963	0%	0.33	0.23	2,538	3,157	7,896	0.28	3,009	0.56
37	11,056	0.26	3,672	0%	0.49	0.34	1,933	2,268	9,528	0.31	2,498	0.53
38	11,860	0.29	3,591	0%	0.19	0.14	2,732	3,297	5,491	0.24	3,148	0.57
39	10,618	0.25	3,580	0%	0.52	0.37	1,807	2,153	9,691	0.31	2,398	0.53
40	11,023	0.27	3,483	0%	0.35	0.25	2,162	2,671	7,217	0.28	2,629	0.54
41	10,263	0.26	3,399	0%	0.48	0.34	1,803	2,111	8,743	0.31	2,343	0.52
42	7,415	0.13	3,349	21%	0.90	0.63	1,005	1,368	2,860	0.18	3,841	0.61
43	8,014	0.19	3,235	1%	0.78	0.55	1,111	1,578	6,922	0.30	2,264	0.52
44	7,324	0.16	3,161	7%	0.85	0.59	948	1,430	3,176	0.25	2,624	0.54
45	8,224	0.21	3,067	0%	0.69	0.48	1,236	1,618	8,771	0.32	2,020	0.50
46	8,277	0.24	2,898	0%	0.59	0.42	1,334	1,646	8,285	0.32	1,933	0.49
47	8,320	0.26	2,741	0%	0.47	0.33	1,475	1,719	6,861	0.29	1,954	0.49
48	8,425	0.28	2,627	0%	0.31	0.22	1,724	2,146	5,042	0.26	2,134	0.51
49	7,975	0.26	2,620	0%	0.46	0.32	1,421	1,652	6,498	0.29	1,885	0.49
50	7,891	0.28	2,470	0%	0.32	0.23	1,593	1,980	4,873	0.26	1,994	0.50
51	7,278	0.26	2,391	0%	0.46	0.32	1,298	1,508	5,982	0.29	1,739	0.48
52	6,909	0.25	2,329	0%	0.52	0.37	1,177	1,401	6,306	0.30	1,643	0.47
53	6,021	0.21	2,271	0%	0.70	0.49	896	1,184	6,258	0.31	1,557	0.46
54	6,506	0.24	2,248	0%	0.57	0.40	1,068	1,301	6,398	0.30	1,558	0.46
55	6,059	0.24	2,098	0%	0.58	0.40	990	1,210	5,923	0.30	1,464	0.46
56	5,603	0.24	1,960	0%	0.59	0.42	905	1,115	5,670	0.30	1,371	0.45
57	5,750	0.26	1,912	0%	0.49	0.34	1,002	1,178	4,937	0.29	1,404	0.45
58	5,635	0.25	1,898	0%	0.52	0.36	960	1,142	5,077	0.29	1,373	0.45
59	4,973	0.23	1,761	0%	0.61	0.43	791	986	5,145	0.30	1,241	0.43
60	4,737	0.24	1,660	0%	0.60	0.42	764	942	4,811	0.30	1,184	0.43
61	4,523	0.24	1,581	0%	0.59	0.41	731	900	4,512	0.29	1,136	0.42
62	4,637	0.25	1,549	0%	0.50	0.35	800	945	4,058	0.28	1,159	0.43
63	4,910	0.28	1,519	0%	0.28	0.20	1,032	1,285	2,767	0.24	1,351	0.45

Table A-2 - Baseline Tax System - Decentralized 30% Income Tax

	Average full time income	Average Labor Supply	GNP Consump.	Unemp-loyment	Labor income Gini	Consumption Gini	Consump. Percentiles 5%	50%	95%	Non-Tradables Average	Price	PPP index
64	4,449	0.25	1,498	0%	0.52	0.36	758	902	4,008	0.28	1,115	0.42
65	4,339	0.27	1,395	0%	0.41	0.29	811	975	3,170	0.26	1,127	0.42
66	4,296	0.27	1,381	0%	0.41	0.28	804	968	3,128	0.26	1,117	0.42
67	3,674	0.23	1,310	0%	0.62	0.44	580	727	3,843	0.29	955	0.40
68	3,675	0.25	1,230	0%	0.51	0.35	633	749	3,234	0.27	944	0.40
69	3,480	0.24	1,199	0%	0.57	0.40	573	697	3,361	0.28	898	0.40
70	2,792	0.22	1,022	0%	0.66	0.46	428	550	2,937	0.28	766	0.38
71	3,129	0.27	1,011	0%	0.42	0.29	578	688	2,348	0.25	840	0.39
72	2,463	0.26	817	0%	0.49	0.34	430	505	2,097	0.26	666	0.36
73	2,084	0.20	801	0%	0.73	0.51	304	410	2,143	0.27	629	0.36
74	2,428	0.27	780	0%	0.40	0.28	455	549	1,775	0.24	677	0.37
75	2,237	0.25	760	0%	0.54	0.38	376	451	2,093	0.26	608	0.35
76	2,285	0.26	753	0%	0.47	0.33	405	472	1,884	0.25	627	0.36
77	2,293	0.28	720	0%	0.33	0.23	459	570	1,443	0.23	669	0.36
78	2,098	0.25	709	0%	0.53	0.37	356	425	1,934	0.26	575	0.35
79	1,900	0.24	660	0%	0.58	0.41	310	379	1,868	0.26	528	0.34
80	1,543	0.21	580	0%	0.70	0.49	230	303	1,607	0.26	468	0.33
81	1,830	0.27	581	0%	0.37	0.26	355	437	1,237	0.23	538	0.34
82	1,336	0.18	550	2%	0.80	0.56	181	263	999	0.24	491	0.33
83	1,252	0.17	521	3%	0.81	0.57	166	246	852	0.23	480	0.33
84	1,473	0.24	511	0%	0.58	0.40	241	294	1,443	0.25	422	0.32
85	1,460	0.24	510	0%	0.59	0.41	236	290	1,472	0.26	419	0.32
86	1,533	0.27	491	0%	0.39	0.28	290	352	1,090	0.23	454	0.32
87	1,443	0.26	471	0%	0.45	0.31	261	304	1,146	0.24	421	0.32
88	1,319	0.25	449	0%	0.54	0.38	221	266	1,230	0.25	382	0.31
89	1,126	0.20	432	0%	0.72	0.51	165	221	1,163	0.25	365	0.30
90	1,188	0.26	391	0%	0.47	0.33	211	246	974	0.23	353	0.30
91	1,110	0.24	380	0%	0.56	0.39	184	223	1,068	0.24	328	0.29
92	1,101	0.25	370	0%	0.52	0.36	188	224	997	0.24	326	0.29
93	1,119	0.26	370	0%	0.48	0.34	197	230	950	0.23	333	0.30
94	1,175	0.27	370	0%	0.35	0.24	232	288	760	0.21	368	0.31
95	1,000	0.23	360	0%	0.64	0.45	156	198	1,056	0.25	306	0.29
96	1,016	0.24	350	0%	0.57	0.40	167	203	981	0.24	304	0.29
97	1,061	0.26	351	0%	0.48	0.33	187	219	888	0.23	318	0.29
98	917	0.22	340	0%	0.68	0.48	139	180	981	0.25	291	0.28
99	1,032	0.27	330	0%	0.39	0.27	197	240	729	0.22	321	0.29
100	932	0.24	320	0%	0.56	0.39	154	187	905	0.24	282	0.28
101	842	0.21	320	0%	0.71	0.50	124	165	867	0.24	278	0.28
102	811	0.20	310	0%	0.72	0.50	119	159	841	0.24	272	0.28
103	934	0.27	300	0%	0.41	0.28	175	210	680	0.22	292	0.28
104	653	0.14	289	14%	0.88	0.61	87	125	235	0.16	374	0.31
105	861	0.26	280	0%	0.44	0.31	157	184	665	0.22	268	0.28
106	749	0.24	260	0%	0.58	0.40	122	149	744	0.23	233	0.26
107	685	0.22	250	0%	0.66	0.46	106	135	731	0.24	221	0.26
108	703	0.25	240	0%	0.55	0.38	118	142	668	0.23	220	0.26
109	627	0.20	240	0%	0.72	0.50	92	123	639	0.23	217	0.26
110	643	0.21	240	0%	0.69	0.48	97	126	686	0.24	214	0.26
111	668	0.24	230	0%	0.57	0.40	110	134	653	0.23	210	0.26
112	649	0.25	219	0%	0.52	0.37	111	132	592	0.22	205	0.25
113	425	0.14	190	16%	0.88	0.62	57	80	157	0.15	274	0.28
114	496	0.20	190	0%	0.72	0.50	73	97	505	0.23	176	0.24
115	388	0.18	160	2%	0.80	0.56	52	76	289	0.20	167	0.24
116	288	0.13	130	21%	0.90	0.63	39	53	112	0.12	220	0.26
117	363	0.26	120	0%	0.48	0.33	64	75	306	0.20	124	0.21
118	289	0.24	100	0%	0.57	0.40	47	58	285	0.21	101	0.20

Table A-3a - Comparison of the Optimal Decentralized and World Taxes, v=2.0.

	Tax rate		GNP Demogrant		Gini Coefficients Labor		Gini Coefficients Consump.		Average Labor Supply		Average Consumption		Nontradables Average		Nontradables Price		PPP index	
	dec.	WIT	dec.	WIT	dec.	WIT	dec.	WIT	dec.	WIT	dec.	WIT	dec.	WIT	dec.	WIT	dec.	WIT
Wld.	0.41	0.62	1,539	3,112	0.75	0.79	0.69	0.25	0.21	0.09	5,027	5,016	0.22	0.13	3,371	7,687		
1	0.21	0.62	10,290	3,112	0.25	0.27	0.20	0.23	0.31	0.33	48,249	21,885	0.38	0.22	26,416	21,390	1.17	1.23
2	0.28	0.62	10,862	3,112	0.33	0.34	0.24	0.29	0.28	0.32	39,163	18,788	0.37	0.23	22,000	16,886	1.09	1.12
3	0.19	0.62	6,794	3,112	0.24	0.27	0.19	0.22	0.32	0.32	36,341	16,491	0.38	0.20	20,369	17,038	1.06	1.13
4	0.19	0.62	6,778	3,112	0.23	0.26	0.19	0.21	0.32	0.31	35,523	16,209	0.37	0.20	20,195	16,991	1.05	1.12
5	0.19	0.62	6,756	3,112	0.23	0.26	0.18	0.21	0.32	0.31	35,256	16,112	0.37	0.20	20,121	16,947	1.05	1.12
6	0.36	0.62	10,373	3,112	0.43	0.44	0.28	0.35	0.25	0.29	29,058	15,072	0.35	0.25	17,525	12,467	1.00	1.00
7	0.34	0.62	9,640	3,112	0.40	0.42	0.27	0.33	0.26	0.29	28,616	14,675	0.35	0.25	17,075	12,596	0.99	1.00
8	0.16	0.62	4,690	3,112	0.21	0.25	0.17	0.19	0.33	0.30	29,358	13,338	0.36	0.19	17,007	14,760	0.99	1.07
9	0.24	0.62	6,402	3,112	0.29	0.33	0.22	0.25	0.30	0.29	26,758	12,923	0.36	0.21	15,567	12,884	0.96	1.01
10	0.19	0.62	5,262	3,112	0.23	0.27	0.19	0.20	0.32	0.30	27,581	12,871	0.36	0.19	16,163	13,891	0.97	1.04
11	0.19	0.62	5,154	3,112	0.23	0.27	0.19	0.20	0.32	0.30	27,012	12,632	0.36	0.19	15,870	13,664	0.97	1.04
12	0.27	0.62	6,745	3,112	0.32	0.36	0.23	0.27	0.29	0.29	24,995	12,419	0.36	0.22	14,757	12,031	0.94	0.99
13	0.19	0.62	4,945	3,112	0.23	0.28	0.19	0.21	0.32	0.29	26,232	12,281	0.36	0.20	15,343	13,222	0.95	1.02
14	0.39	0.62	8,440	3,112	0.48	0.50	0.29	0.37	0.23	0.27	21,669	11,853	0.33	0.25	13,907	9,955	0.92	0.92
15	0.27	0.62	6,511	3,112	0.32	0.36	0.23	0.27	0.29	0.29	24,125	12,034	0.35	0.22	14,305	11,721	0.93	0.98
16	0.31	0.62	6,983	3,112	0.37	0.40	0.25	0.30	0.27	0.28	22,433	11,617	0.35	0.23	13,612	10,853	0.91	0.95
17	0.30	0.62	5,962	3,112	0.35	0.40	0.25	0.28	0.27	0.27	20,114	10,454	0.34	0.22	12,274	10,153	0.88	0.93
18	0.21	0.62	4,504	3,112	0.25	0.31	0.20	0.21	0.31	0.28	21,344	10,390	0.35	0.20	12,814	11,184	0.90	0.96
19	0.26	0.62	5,252	3,112	0.31	0.36	0.23	0.25	0.29	0.27	19,975	10,161	0.35	0.21	12,150	10,373	0.88	0.94
20	0.30	0.62	5,731	3,112	0.36	0.41	0.25	0.28	0.27	0.26	19,189	10,050	0.34	0.22	11,730	9,768	0.87	0.91
21	0.30	0.62	5,267	3,112	0.36	0.41	0.25	0.27	0.27	0.25	17,417	9,293	0.34	0.21	10,858	9,250	0.85	0.90
22	0.27	0.62	3,905	3,112	0.32	0.39	0.23	0.23	0.29	0.24	14,368	7,764	0.33	0.20	9,098	8,344	0.80	0.86
23	0.39	0.62	4,916	3,112	0.47	0.52	0.29	0.31	0.23	0.21	12,722	7,657	0.31	0.21	8,717	7,581	0.79	0.83
24	0.27	0.62	3,266	3,112	0.32	0.41	0.23	0.22	0.29	0.21	12,089	6,772	0.33	0.19	7,788	7,562	0.76	0.83
25	0.30	0.62	3,195	3,112	0.36	0.45	0.25	0.23	0.27	0.20	10,589	6,277	0.32	0.19	6,998	7,065	0.73	0.81
26	0.21	0.62	2,288	3,112	0.25	0.36	0.20	0.17	0.31	0.20	10,687	5,933	0.32	0.17	7,017	7,185	0.73	0.81
27	0.39	0.62	3,033	3,112	0.47	0.56	0.29	0.24	0.23	0.15	7,841	5,480	0.29	0.18	5,671	6,396	0.69	0.77
28	0.37	0.62	2,046	3,112	0.45	0.56	0.28	0.17	0.24	0.12	5,540	4,486	0.28	0.16	4,114	5,955	0.62	0.74
29	0.19	0.62	1,059	3,112	0.23	0.39	0.19	0.08	0.32	0.10	5,581	3,950	0.30	0.15	3,943	5,617	0.62	0.71
30	0.49	0.62	1,975	3,112	0.63	0.68	0.32	0.19	0.17	0.09	4,049	4,317	0.23	0.15	3,736	6,147	0.61	0.75
31	0.26	0.62	1,243	3,112	0.30	0.44	0.22	0.09	0.29	0.09	4,841	3,901	0.29	0.15	3,491	5,617	0.59	0.71
32	0.32	0.62	1,422	3,112	0.38	0.51	0.26	0.11	0.27	0.09	4,506	3,974	0.29	0.15	3,298	5,714	0.58	0.72
33	0.52	0.62	1,928	3,112	0.67	0.71	0.32	0.19	0.15	0.08	3,712	4,274	0.21	0.14	3,747	6,247	0.61	0.76
34	0.46	0.62	1,772	3,112	0.59	0.66	0.32	0.17	0.18	0.09	3,820	4,167	0.24	0.15	3,373	6,050	0.59	0.74
35	0.35	0.62	1,454	3,112	0.42	0.53	0.27	0.12	0.25	0.09	4,214	3,962	0.28	0.15	3,169	5,747	0.58	0.72
36	0.28	0.62	1,127	3,112	0.32	0.45	0.23	0.08	0.28	0.08	4,041	3,737	0.28	0.14	2,992	5,578	0.57	0.69
37	0.43	0.62	1,398	3,112	0.53	0.60	0.30	0.12	0.21	0.08	3,275	3,883	0.25	0.14	2,768	5,897	0.56	0.72
38	0.13	0.62	521	3,112	0.17	0.25	0.15	0.03	0.34	0.06	4,172	3,485	0.28	0.14	3,107	5,324	0.58	0.64
39	0.45	0.62	1,418	3,112	0.57	0.63	0.31	0.13	0.19	0.08	3,128	3,905	0.24	0.14	2,774	5,983	0.56	0.73
40	0.30	0.62	1,043	3,112	0.35	0.46	0.25	0.07	0.27	0.07	3,485	3,654	0.28	0.14	2,629	5,603	0.55	0.69
41	0.42	0.62	1,273	3,112	0.52	0.59	0.30	0.11	0.21	0.07	3,062	3,802	0.25	0.14	2,565	5,879	0.54	0.72
42	0.81	0.62	2,528	3,112	0.97	0.94	0.19	0.28	0.02	0.04	3,132	4,420	0.05	0.08	14,645	11,733	0.94	1.01
43	0.68	0.62	1,857	3,112	0.88	0.85	0.28	0.22	0.06	0.06	2,737	4,211	0.11	0.12	5,277	7,479	0.67	0.82
44	0.74	0.62	2,095	3,112	0.94	0.90	0.24	0.25	0.04	0.05	2,814	4,294	0.07	0.10	8,014	8,870	0.77	0.89
45	0.61	0.62	1,519	3,112	0.78	0.77	0.31	0.17	0.10	0.06	2,509	4,012	0.15	0.13	3,497	6,669	0.59	0.78
46	0.52	0.62	1,257	3,112	0.66	0.68	0.32	0.13	0.15	0.07	2,434	3,825	0.20	0.13	2,561	6,227	0.54	0.74
47	0.41	0.62	1,012	3,112	0.50	0.56	0.30	0.08	0.22	0.06	2,487	3,632	0.25	0.13	2,112	5,867	0.52	0.71
48	0.26	0.62	702	3,112	0.30	0.35	0.22	0.04	0.29	0.05	2,733	3,458	0.27	0.13	2,111	5,555	0.52	0.66
49	0.40	0.62	960	3,112	0.50	0.54	0.30	0.07	0.22	0.06	2,388	3,600	0.25	0.13	2,026	5,861	0.51	0.70
50	0.26	0.62	672	3,112	0.31	0.36	0.23	0.04	0.29	0.05	2,556	3,450	0.27	0.13	1,975	5,598	0.51	0.66
51	0.40	0.62	876	3,112	0.50	0.53	0.30	0.07	0.22	0.06	2,179	3,557	0.25	0.13	1,869	5,883	0.50	0.70
52	0.45	0.62	923	3,112	0.57	0.59	0.31	0.08	0.19	0.06	2,033	3,604	0.22	0.13	1,903	6,041	0.50	0.72
53	0.60	0.62	1,133	3,112	0.80	0.77	0.32	0.14	0.10	0.06	1,884	3,809	0.15	0.12	2,719	6,829	0.55	0.78
54	0.49	0.62	945	3,112	0.63	0.64	0.32	0.09	0.16	0.06	1,913	3,638	0.21	0.12	1,960	6,198	0.50	0.73
55	0.50	0.62	891	3,112	0.64	0.64	0.32	0.09	0.16	0.06	1,774	3,611	0.20	0.12	1,869	6,234	0.50	0.73
56	0.51	0.62	841	3,112	0.66	0.65	0.33	0.09	0.15	0.05	1,661	3,600	0.20	0.12	1,786	6,320	0.49	0.74
57	0.43	0.62	726	3,112	0.53	0.54	0.31	0.06	0.21	0.05	1,710	3,501	0.23	0.12	1,556	6,028	0.47	0.70
58	0.45	0.62	751	3,112	0.57	0.57	0.31	0.07	0.19	0.05	1,660	3,522	0.22	0.12	1,587	6,105	0.48	0.71
59	0.53	0.62	777	3,112	0.69	0.66	0.32	0.09	0.14	0.05	1,477	3,579	0.18	0.12	1,700	6,440	0.49	0.74
60	0.51	0.62	717	3,112	0.66	0.64	0.32	0.08	0.15	0.05	1,402	3,543	0.19	0.12	1,558	6,396	0.47	0.74
61	0.51	0.62	683	3,112	0.66	0.63	0.32	0.07	0.15	0.05	1,329	3,525	0.19	0.12	1,494	6,403	0.47	0.74
62	0.43	0.62	593	3,112	0.54	0.53	0.31	0.05	0.20	0.05	1,382	3,457	0.22	0.12	1,296	6,149	0.45	0.71
63	0.23	0.62	368	3,112	0.27	0.28	0.21	0.02	0.30	0.04	1,624	3,384	0.26	0.12	1,333	5,807	0.45	0.66
64	0.45	0.62	593	3,112	0.57	0.55	0.31	0.06	0.19	0.05	1,310	3,461	0.21	0.12	1,289	6,210	0.45	0.71

Table A-3a - Comparison of the Optimal Decentralized and World Taxes, v=2.0.

	GNP				Gini Coefficients				Average		Average		Nontradables				PPP	
	Tax rate		Demogrant		Labor		Consump.		Labor Supply		Consumption		Average		Price		index	
	dec.	WIT	dec.	WIT	dec.	WIT	dec.	WIT	dec.	WIT	dec.	WIT	dec.	WIT	dec.	WIT	dec.	WIT
65	0.35	0.62	467	3,112	0.42	0.42	0.27	0.04	0.25	0.04	1,331	3,401	0.24	0.12	1,155	6,016	0.44	0.69
66	0.35	0.62	464	3,112	0.42	0.42	0.27	0.04	0.25	0.04	1,315	3,400	0.24	0.12	1,147	6,019	0.44	0.69
67	0.54	0.62	588	3,112	0.70	0.65	0.32	0.07	0.13	0.05	1,092	3,502	0.17	0.11	1,350	6,624	0.46	0.75
68	0.45	0.62	481	3,112	0.55	0.52	0.31	0.05	0.19	0.05	1,079	3,423	0.21	0.12	1,076	6,283	0.43	0.71
69	0.49	0.62	500	3,112	0.63	0.58	0.32	0.06	0.17	0.05	1,025	3,448	0.19	0.11	1,115	6,460	0.43	0.73
70	0.57	0.62	483	3,112	0.75	0.67	0.32	0.07	0.11	0.04	846	3,478	0.15	0.11	1,197	6,947	0.44	0.77
71	0.36	0.62	345	3,112	0.44	0.43	0.28	0.04	0.24	0.04	956	3,388	0.23	0.11	868	6,249	0.40	0.71
72	0.42	0.62	309	3,112	0.53	0.49	0.30	0.04	0.21	0.04	733	3,390	0.21	0.11	734	6,514	0.38	0.73
73	0.63	0.62	416	3,112	0.82	0.72	0.31	0.08	0.08	0.04	665	3,478	0.12	0.10	1,198	7,525	0.44	0.82
74	0.35	0.62	258	3,112	0.42	0.41	0.27	0.03	0.25	0.04	748	3,383	0.23	0.11	692	6,414	0.38	0.72
75	0.46	0.62	306	3,112	0.59	0.53	0.32	0.05	0.18	0.04	659	3,396	0.19	0.11	719	6,678	0.38	0.74
76	0.41	0.62	281	3,112	0.51	0.47	0.30	0.04	0.21	0.04	678	3,386	0.21	0.11	682	6,541	0.38	0.73
77	0.27	0.62	200	3,112	0.33	0.34	0.24	0.03	0.29	0.04	739	3,381	0.23	0.11	663	6,393	0.37	0.72
78	0.45	0.62	281	3,112	0.58	0.52	0.32	0.04	0.19	0.04	622	3,392	0.20	0.11	666	6,707	0.37	0.75
79	0.51	0.62	281	3,112	0.65	0.57	0.32	0.05	0.16	0.04	557	3,398	0.17	0.10	679	6,899	0.38	0.76
80	0.60	0.62	289	3,112	0.79	0.68	0.32	0.06	0.10	0.04	481	3,428	0.12	0.10	813	7,562	0.40	0.82
81	0.31	0.62	178	3,112	0.37	0.37	0.25	0.03	0.27	0.04	575	3,381	0.22	0.11	540	6,596	0.35	0.74
82	0.70	0.62	328	3,112	0.90	0.78	0.27	0.08	0.05	0.04	470	3,469	0.08	0.08	1,237	8,712	0.44	0.91
83	0.72	0.62	322	3,112	0.91	0.79	0.25	0.08	0.05	0.04	446	3,470	0.07	0.08	1,323	8,992	0.45	0.93
84	0.50	0.62	216	3,112	0.64	0.56	0.32	0.05	0.16	0.04	434	3,390	0.17	0.10	536	7,091	0.35	0.78
85	0.51	0.62	218	3,112	0.66	0.58	0.32	0.05	0.15	0.04	431	3,391	0.17	0.10	545	7,133	0.35	0.78
86	0.34	0.62	159	3,112	0.40	0.40	0.27	0.03	0.26	0.04	474	3,381	0.22	0.11	461	6,764	0.33	0.75
87	0.39	0.62	168	3,112	0.47	0.45	0.29	0.04	0.23	0.04	435	3,381	0.21	0.10	445	6,871	0.33	0.76
88	0.47	0.62	182	3,112	0.60	0.53	0.32	0.04	0.18	0.04	388	3,384	0.18	0.10	456	7,100	0.33	0.78
89	0.62	0.62	223	3,112	0.82	0.70	0.31	0.06	0.09	0.04	358	3,414	0.11	0.09	685	7,974	0.38	0.86
90	0.41	0.62	144	3,112	0.50	0.47	0.30	0.04	0.22	0.04	355	3,381	0.20	0.10	380	7,061	0.32	0.78
91	0.49	0.62	158	3,112	0.62	0.54	0.32	0.04	0.17	0.04	325	3,384	0.17	0.10	403	7,276	0.32	0.80
92	0.45	0.62	146	3,112	0.57	0.51	0.31	0.04	0.19	0.04	324	3,381	0.18	0.10	376	7,203	0.31	0.79
93	0.43	0.62	140	3,112	0.52	0.48	0.30	0.04	0.21	0.04	331	3,381	0.19	0.10	368	7,132	0.31	0.78
94	0.29	0.62	108	3,112	0.34	0.35	0.24	0.03	0.28	0.04	374	3,381	0.21	0.10	367	6,938	0.31	0.77
95	0.55	0.62	165	3,112	0.72	0.62	0.32	0.05	0.13	0.04	298	3,389	0.14	0.09	450	7,604	0.33	0.83
96	0.49	0.62	146	3,112	0.63	0.55	0.32	0.04	0.17	0.04	299	3,383	0.17	0.10	377	7,375	0.31	0.80
97	0.41	0.62	130	3,112	0.51	0.48	0.30	0.04	0.21	0.04	318	3,381	0.19	0.10	346	7,173	0.31	0.79
98	0.59	0.62	164	3,112	0.77	0.65	0.32	0.05	0.11	0.04	281	3,394	0.12	0.09	478	7,878	0.34	0.85
99	0.33	0.62	105	3,112	0.39	0.39	0.27	0.03	0.26	0.04	321	3,381	0.21	0.10	325	7,086	0.30	0.78
100	0.49	0.62	133	3,112	0.62	0.55	0.32	0.04	0.17	0.04	274	3,383	0.17	0.10	347	7,443	0.31	0.81
101	0.62	0.62	163	3,112	0.81	0.68	0.31	0.06	0.09	0.04	263	3,398	0.11	0.09	515	8,145	0.35	0.87
102	0.63	0.62	161	3,112	0.82	0.69	0.30	0.06	0.08	0.04	255	3,398	0.10	0.09	519	8,242	0.35	0.88
103	0.35	0.62	101	3,112	0.42	0.41	0.27	0.03	0.25	0.04	286	3,381	0.20	0.10	299	7,191	0.29	0.79
104	0.78	0.62	207	3,112	0.96	0.85	0.21	0.08	0.03	0.03	265	3,444	0.04	0.06	1,322	12,118	0.45	1.15
105	0.38	0.62	98	3,112	0.46	0.44	0.29	0.04	0.23	0.04	260	3,381	0.20	0.10	281	7,298	0.29	0.80
106	0.50	0.62	110	3,112	0.64	0.56	0.32	0.05	0.16	0.04	220	3,381	0.16	0.09	298	7,672	0.29	0.83
107	0.57	0.62	117	3,112	0.74	0.63	0.32	0.05	0.12	0.04	206	3,385	0.13	0.09	343	8,027	0.30	0.86
108	0.47	0.62	98	3,112	0.60	0.54	0.32	0.04	0.18	0.04	207	3,381	0.17	0.09	264	7,658	0.28	0.83
109	0.63	0.62	124	3,112	0.82	0.68	0.30	0.06	0.08	0.04	197	3,392	0.10	0.08	414	8,485	0.32	0.90
110	0.60	0.62	118	3,112	0.78	0.66	0.31	0.05	0.10	0.04	197	3,386	0.11	0.09	368	8,242	0.31	0.88
111	0.49	0.62	96	3,112	0.63	0.55	0.32	0.04	0.17	0.04	197	3,381	0.16	0.09	261	7,748	0.28	0.84
112	0.45	0.62	86	3,112	0.57	0.52	0.31	0.04	0.19	0.04	192	3,381	0.17	0.09	236	7,683	0.27	0.83
113	0.80	0.62	139	3,112	0.96	0.85	0.19	0.08	0.02	0.03	174	3,420	0.04	0.05	1,027	13,287	0.42	1.26
114	0.63	0.62	98	3,112	0.82	0.68	0.30	0.06	0.08	0.04	156	3,386	0.10	0.08	337	8,707	0.30	0.92
115	0.70	0.62	96	3,112	0.90	0.76	0.27	0.06	0.05	0.04	138	3,396	0.07	0.07	420	10,026	0.32	1.03
116	0.81	0.62	98	3,112	0.97	0.86	0.19	0.08	0.02	0.03	121	3,406	0.03	0.05	843	15,187	0.40	1.41
117	0.42	0.62	45	3,112	0.51	0.48	0.30	0.04	0.21	0.04	108	3,381	0.17	0.09	135	8,155	0.22	0.87
118	0.50	0.62	42	3,112	0.64	0.56	0.32	0.05	0.16	0.04	85	3,381	0.14	0.08	127	8,589	0.22	0.91

Table A-3b: Comparison of the Optimal Decentralized and World Income Taxes, Further Details.

	Average Labor Income		GNP Consumption		Revenue		Consumption Percentiles 5%		Consumption Percentiles 50%		Consumption Percentiles 95%		Average Welfare		U.S. Welfare Weights	
	dec.	WIT	dec.	WIT	dec.	WIT	dec.	WIT	dec.	WIT	dec.	WIT	dec.	WIT	dec.	WIT
Wld.	5,027	5,016	2%	15%	0.0	0.0	566	4,962	1,599	6,198	28,784	14,043	-7,564,213	-4,384,246	0.1591	0.3795
1	48,249	49,451	0%	0%	0.0	27,565.3	32,464	12,348	41,230	19,210	86,927	41,261	-2,376,352	-3,225,743	2.0937	1.9854
2	39,163	41,293	0%	0%	0.0	22,504.5	24,788	9,527	31,076	15,368	78,748	40,416	-2,502,612	-3,379,862	1.5370	1.4922
3	36,341	35,243	0%	0%	0.0	18,751.5	24,674	9,807	31,402	14,641	64,349	30,025	-2,602,954	-3,454,813	1.4493	1.4359
4	35,523	34,499	0%	0%	0.0	18,289.9	24,399	9,792	30,940	14,491	61,895	29,013	-2,616,832	-3,467,047	1.4200	1.4207
5	35,256	34,245	0%	0%	0.0	18,132.2	24,293	9,771	30,775	14,430	61,200	28,718	-2,621,713	-3,471,425	1.4097	1.4140
6	29,058	31,504	0%	0%	0.0	16,432.0	17,373	6,835	20,198	10,808	65,683	37,657	-2,698,305	-3,608,738	1.0000	1.0000
7	28,616	30,459	0%	0%	0.0	15,783.9	17,349	6,971	20,732	10,977	62,845	35,082	-2,720,756	-3,612,741	0.9909	1.0136
8	29,358	26,938	0%	0%	0.0	13,599.3	20,571	8,537	26,016	12,123	49,454	22,713	-2,788,604	-3,624,308	1.1158	1.1531
9	26,758	25,842	0%	0%	0.0	12,919.9	17,342	7,335	22,015	10,955	51,181	25,508	-2,827,967	-3,666,763	0.9492	1.0162
10	27,581	25,707	0%	0%	0.0	12,835.6	18,943	8,004	24,047	11,520	48,257	22,878	-2,824,413	-3,656,582	1.0214	1.0820
11	27,012	25,077	0%	0%	0.0	12,445.3	18,553	7,875	23,551	11,306	47,262	22,430	-2,842,209	-3,671,775	0.9941	1.0586
12	24,995	24,516	0%	0%	0.0	12,097.3	15,856	6,814	19,938	10,220	50,056	25,878	-2,870,084	-3,707,399	0.8575	0.9374
13	26,232	24,153	0%	0%	0.0	11,871.9	17,862	7,615	22,720	10,924	46,272	21,942	-2,870,106	-3,695,599	0.9509	1.0178
14	21,669	23,026	0%	0%	0.0	11,172.5	12,695	5,413	14,568	7,875	50,730	30,763	-2,931,265	-3,812,202	0.6703	0.7298
15	24,125	23,503	0%	0%	0.0	11,468.5	15,295	6,641	19,218	9,891	48,044	24,877	-2,900,910	-3,731,676	0.8188	0.9053
16	22,433	22,404	0%	0%	0.0	10,787.1	13,827	6,092	16,935	9,061	47,212	25,748	-2,941,986	-3,774,286	0.7312	0.8247
17	20,114	19,341	0%	0%	0.0	8,886.8	12,502	5,747	15,464	8,305	41,590	22,403	-3,049,718	-3,846,992	0.6374	0.7511
18	21,344	19,171	0%	0%	0.0	8,781.0	14,287	6,451	18,188	9,100	38,951	19,090	-3,041,554	-3,830,559	0.7210	0.8249
19	19,975	18,570	0%	0%	0.0	8,408.1	12,816	5,932	16,165	8,476	39,263	20,371	-3,073,514	-3,856,716	0.6459	0.7638
20	19,189	18,277	0%	0%	0.0	8,226.4	11,830	5,528	14,611	7,913	40,394	21,872	-3,093,627	-3,878,108	0.5953	0.7139
21	17,417	16,283	0%	0%	0.0	6,989.7	10,812	5,260	13,346	7,353	36,416	19,906	-3,180,572	-3,932,527	0.5284	0.6618
22	14,368	12,256	0%	0%	0.0	4,491.4	9,137	4,828	11,475	6,380	28,503	15,256	-3,389,430	-4,048,590	0.4183	0.5705
23	12,722	11,973	0%	0%	0.0	4,315.9	7,539	4,228	8,612	5,226	29,598	18,335	-3,440,870	-4,085,889	0.3387	0.4979
24	12,089	9,642	0%	0%	0.0	2,870.2	7,663	4,411	9,628	5,531	24,066	13,041	-3,573,026	-4,136,052	0.3331	0.4973
25	10,589	8,339	0%	0%	0.0	2,061.5	6,566	4,107	8,109	4,918	22,130	12,542	-3,696,745	-4,182,949	0.2761	0.4522
26	10,687	7,432	0%	0%	0.0	1,498.7	7,194	4,291	9,145	5,160	19,344	10,086	-3,743,192	-4,214,879	0.2945	0.4552
27	7,841	6,238	0%	0%	0.0	758.2	4,605	3,584	5,276	4,053	18,292	11,785	-3,984,984	-4,266,042	0.1788	0.3776
28	5,540	3,619	0%	0%	0.0	-866.3	3,289	3,358	3,756	3,755	12,715	8,352	-4,438,514	-4,354,366	0.1149	0.3294
29	5,581	2,209	0%	0%	0.0	-1,741.2	3,812	3,434	4,844	3,650	9,805	5,561	-4,575,403	-4,401,519	0.1272	0.3110
30	4,049	3,176	0%	6%	0.0	-1,141.2	2,308	3,112	2,752	3,617	10,057	8,066	-4,778,796	-4,393,609	0.0736	0.3044
31	4,841	2,078	0%	0%	0.0	-1,822.3	3,126	3,343	3,952	3,603	9,393	5,715	-4,718,207	-4,405,774	0.1025	0.3047
32	4,506	2,272	0%	1%	0.0	-1,701.9	2,743	3,282	3,337	3,606	9,728	6,257	-4,774,669	-4,401,206	0.0894	0.3054
33	3,712	3,063	1%	10%	0.0	-1,211.3	2,120	3,112	2,559	3,584	9,078	7,763	-4,879,950	-4,406,617	0.0660	0.2983
34	3,820	2,780	0%	6%	0.0	-1,386.7	2,185	3,112	2,579	3,595	9,467	7,392	-4,882,837	-4,401,428	0.0684	0.3016
35	4,214	2,240	0%	1%	0.0	-1,721.7	2,527	3,242	2,979	3,591	9,438	6,309	-4,843,656	-4,404,327	0.0811	0.3029
36	4,041	1,646	0%	0%	0.0	-2,090.2	2,566	3,261	3,216	3,531	8,097	5,195	-4,961,715	-4,422,498	0.0802	0.2933
37	3,275	2,031	0%	5%	0.0	-1,851.6	1,900	3,112	2,205	3,534	7,981	6,098	-5,145,511	-4,422,268	0.0568	0.2928
38	4,172	985	0%	0%	0.0	-2,500.5	3,071	3,291	3,816	3,440	6,559	3,913	-5,051,082	-4,437,549	0.0900	0.2792
39	3,128	2,090	0%	7%	0.0	-1,815.0	1,798	3,112	2,110	3,527	7,781	6,192	-5,193,530	-4,425,147	0.0530	0.2914
40	3,485	1,429	0%	1%	0.0	-2,225.1	2,162	3,203	2,672	3,492	7,221	4,856	-5,171,398	-4,432,955	0.0650	0.2871
41	3,062	1,819	0%	6%	0.0	-1,983.0	1,774	3,112	2,055	3,511	7,455	5,689	-5,264,660	-4,430,319	0.0519	0.2893
42	3,132	3,446	77%	62%	0.0	-973.9	2,528	3,112	2,528	3,112	3,557	5,273	-5,171,903	-4,680,421	0.0452	0.2094
43	2,737	2,895	36%	36%	0.0	-1,315.4	1,857	3,112	1,992	3,335	3,702	4,711	-5,282,645	-4,500,764	0.0446	0.2634
44	2,814	3,114	59%	49%	0.0	-1,179.6	2,095	3,112	2,095	3,129	3,089	4,953	-5,264,397	-4,571,656	0.0441	0.2410
45	2,509	2,371	11%	24%	0.0	-1,640.9	1,519	3,112	1,810	3,438	5,321	5,724	-5,429,421	-4,461,176	0.0404	0.2770
46	2,434	1,879	0%	15%	0.0	-1,945.6	1,391	3,112	1,676	3,465	5,964	5,470	-5,543,585	-4,448,945	0.0381	0.2818
47	2,487	1,370	0%	8%	0.0	-2,261.5	1,447	3,112	1,670	3,456	5,928	4,707	-5,613,362	-4,449,045	0.0398	0.2811
48	2,733	912	0%	2%	0.0	-2,545.8	1,764	3,174	2,228	3,415	5,303	3,728	-5,606,155	-4,452,722	0.0487	0.2753
49	2,388	1,287	0%	8%	0.0	-2,312.9	1,393	3,112	1,605	3,447	5,657	4,518	-5,687,551	-4,452,400	0.0378	0.2796
50	2,556	893	0%	3%	0.0	-2,557.9	1,624	3,158	2,045	3,410	5,092	3,696	-5,718,895	-4,455,937	0.0441	0.2745
51	2,179	1,172	0%	9%	0.0	-2,384.3	1,272	3,112	1,465	3,431	5,207	4,252	-5,846,696	-4,458,642	0.0336	0.2771
52	2,033	1,297	0%	13%	0.0	-2,307.1	1,171	3,112	1,374	3,430	5,059	4,431	-5,912,365	-4,461,642	0.0303	0.2769
53	1,884	1,836	12%	29%	0.0	-1,972.6	1,133	3,112	1,345	3,368	3,836	4,409	-5,937,114	-4,486,887	0.0274	0.2684
54	1,913	1,388	0%	17%	0.0	-2,250.7	1,094	3,112	1,306	3,420	4,796	4,486	-5,983,882	-4,466,417	0.0278	0.2755
55	1,774	1,316	0%	18%	0.0	-2,295.4	1,017	3,112	1,217	3,407	4,378	4,237	-6,109,903	-4,471,342	0.0253	0.2739
56	1,661	1,287	0%	20%	0.0	-2,313.3	943	3,112	1,135	3,395	4,154	4,108	-6,237,810	-4,477,162	0.0230	0.2720
57	1,710	1,026	0%	13%	0.0	-2,475.2	988	3,112	1,148	3,400	4,153	3,900	-6,265,638	-4,472,782	0.0243	0.2726
58	1,660	1,081	0%	15%	0.0	-2,441.2	955	3,112	1,120	3,399	4,082	3,945	-6,288,349	-4,474,412	0.0233	0.2725
59	1,477	1,231	1%	23%	0.0	-2,347.8	839	3,112	1,019	3,375	3,635	4,104	-6,441,522	-4,485,807	0.0198	0.2695
60	1,402	1,136	0%	22%	0.0	-2,406.9	798	3,112	962	3,372	3,498	4,060	-6,558,073	-4,487,327	0.0185	0.2690
61	1,329	1,088	0%	22%	0.0	-2,436.4	760	3,112	915	3,368	3,262	4,041	-6,655,445	-4,489,671	0.0174	0.2684
62	1,382	910	0%	16%	0.0	-2,546.9	792	3,112	924	3,377	3,387	3,890	-6,680,140	-4,484,377	0.0182	0.2694
63	1,624	716	0%	2%	0.0	-2,667.1	1,078	3,164	1,369	3,378	3,007	3,616	-6,595,349	-4,475,803	0.0251	0.2693
64	1,310	921	0%	17%	0.0	-2,540.3	754	3,112	884	3,373	3,223	3,913	-6,753,051	-4,487,077	0.0171	0.2689

Table A-3b: Comparison of the Optimal Decentralized and World Income Taxes, Further Details.

	Average Labor Income		GNP Consumption		Revenue		Consumption Percentiles						Average Welfare		U.S. Welfare Weights	
							5%		50%		95%					
	dec.	WIT	dec.	WIT	dec.	WIT	dec.	WIT	dec.	WIT	dec.	WIT	dec.	WIT	dec.	WIT
65	1,331	764	0%	9%	0.0	-2,637.9	797	3,112	933	3,374	2,967	3,750	-6,847,657	-4,484,557	0.0181	0.2686
66	1,315	760	0%	9%	0.0	-2,640.0	789	3,112	926	3,374	2,923	3,747	-6,868,371	-4,484,925	0.0179	0.2686
67	1,092	1,029	2%	27%	0.0	-2,473.1	623	3,112	760	3,339	2,656	4,084	-7,039,983	-4,503,472	0.0134	0.2647
68	1,079	821	0%	17%	0.0	-2,602.4	626	3,112	730	3,361	2,630	3,874	-7,163,034	-4,495,598	0.0134	0.2669
69	1,025	886	0%	22%	0.0	-2,561.6	584	3,112	697	3,349	2,546	3,965	-7,231,898	-4,501,435	0.0123	0.2656
70	846	967	5%	32%	0.0	-2,511.9	483	3,112	597	3,299	1,910	4,129	-7,576,648	-4,522,016	0.0097	0.2600
71	956	729	0%	11%	0.0	-2,659.2	567	3,112	653	3,365	2,167	3,756	-7,555,157	-4,499,011	0.0117	0.2668
72	733	735	0%	17%	0.0	-2,655.8	424	3,112	492	3,350	1,772	3,831	-8,094,484	-4,512,181	0.0081	0.2647
73	665	966	19%	40%	0.0	-2,512.3	416	3,112	480	3,233	1,251	4,256	-8,109,220	-4,549,222	0.0071	0.2524
74	748	714	0%	10%	0.0	-2,668.6	448	3,112	528	3,364	1,676	3,736	-8,158,550	-4,508,957	0.0085	0.2661
75	659	750	0%	22%	0.0	-2,646.5	378	3,112	446	3,337	1,654	3,899	-8,294,005	-4,519,325	0.0070	0.2631
76	678	723	0%	16%	0.0	-2,663.0	397	3,112	458	3,352	1,610	3,808	-8,288,913	-4,514,410	0.0074	0.2647
77	739	710	0%	5%	0.0	-2,671.2	466	3,117	585	3,372	1,494	3,662	-8,303,545	-4,508,919	0.0087	0.2668
78	622	739	0%	21%	0.0	-2,653.1	355	3,112	418	3,338	1,560	3,885	-8,464,838	-4,521,480	0.0064	0.2631
79	557	756	0%	26%	0.0	-2,642.8	319	3,112	382	3,318	1,372	3,952	-8,662,707	-4,529,693	0.0056	0.2610
80	481	832	12%	39%	0.0	-2,595.2	289	3,112	344	3,242	988	4,166	-8,961,332	-4,556,293	0.0046	0.2529
81	575	710	0%	7%	0.0	-2,671.1	354	3,112	434	3,369	1,223	3,696	-8,887,802	-4,519,429	0.0062	0.2658
82	470	941	42%	51%	0.0	-2,527.8	328	3,112	341	3,112	526	4,423	-8,988,526	-4,600,673	0.0045	0.2379
83	446	944	48%	53%	0.0	-2,525.7	322	3,112	325	3,112	476	4,461	-9,117,275	-4,611,606	0.0042	0.2350
84	434	733	0%	26%	0.0	-2,656.7	247	3,112	296	3,315	1,073	3,942	-9,357,600	-4,540,427	0.0040	0.2600
85	431	737	0%	28%	0.0	-2,654.5	245	3,112	295	3,310	1,078	3,965	-9,363,731	-4,542,040	0.0040	0.2594
86	474	710	0%	9%	0.0	-2,671.2	286	3,112	341	3,364	1,040	3,722	-9,374,872	-4,527,869	0.0047	0.2650
87	435	711	0%	14%	0.0	-2,670.7	256	3,112	293	3,355	1,022	3,780	-9,532,421	-4,532,568	0.0042	0.2639
88	388	718	0%	23%	0.0	-2,666.2	222	3,112	263	3,327	963	3,892	-9,720,412	-4,542,144	0.0035	0.2609
89	358	796	18%	42%	0.0	-2,617.5	223	3,112	258	3,209	683	4,208	-9,776,038	-4,575,815	0.0032	0.2489
90	355	711	0%	16%	0.0	-2,670.8	207	3,112	239	3,349	844	3,800	-10,098,315	-4,541,819	0.0032	0.2629
91	325	717	0%	24%	0.0	-2,666.9	187	3,112	221	3,322	813	3,913	-10,222,712	-4,550,603	0.0028	0.2599
92	324	711	0%	21%	0.0	-2,670.6	187	3,112	219	3,335	804	3,863	-10,293,126	-4,548,001	0.0028	0.2612
93	331	711	0%	17%	0.0	-2,670.8	193	3,112	223	3,346	799	3,820	-10,274,113	-4,545,133	0.0029	0.2623
94	374	711	0%	6%	0.0	-2,670.7	234	3,112	291	3,371	770	3,675	-10,158,772	-4,537,502	0.0036	0.2650
95	298	731	3%	33%	0.0	-2,658.1	170	3,112	209	3,279	708	4,035	-10,393,068	-4,563,841	0.0025	0.2555
96	299	716	0%	26%	0.0	-2,667.5	171	3,112	203	3,316	743	3,923	-10,483,914	-4,555,231	0.0025	0.2592
97	318	710	0%	17%	0.0	-2,670.8	184	3,112	213	3,346	764	3,813	-10,441,327	-4,547,193	0.0027	0.2623
98	281	745	8%	38%	0.0	-2,649.4	164	3,112	200	3,247	620	4,112	-10,547,785	-4,574,732	0.0023	0.2522
99	321	711	0%	9%	0.0	-2,670.7	194	3,112	234	3,366	703	3,717	-10,562,155	-4,544,358	0.0029	0.2641
100	274	715	0%	25%	0.0	-2,668.1	157	3,112	186	3,319	689	3,921	-10,768,137	-4,558,598	0.0022	0.2592
101	263	754	16%	41%	0.0	-2,643.8	163	3,112	190	3,215	508	4,166	-10,716,204	-4,585,369	0.0021	0.2490
102	255	755	18%	42%	0.0	-2,642.9	161	3,112	185	3,205	485	4,191	-10,804,750	-4,589,242	0.0021	0.2479
103	286	710	0%	10%	0.0	-2,671.0	172	3,112	201	3,362	635	3,734	-10,884,054	-4,549,296	0.0024	0.2636
104	265	876	70%	65%	0.0	-2,568.4	207	3,112	207	3,112	299	4,715	-10,801,604	-4,718,908	0.0019	0.2073
105	260	711	0%	13%	0.0	-2,670.8	154	3,112	176	3,357	600	3,766	-11,146,419	-4,554,026	0.0021	0.2628
106	220	710	0%	27%	0.0	-2,670.9	126	3,112	151	3,309	550	3,940	-11,473,267	-4,569,159	0.0017	0.2578
107	206	721	5%	36%	0.0	-2,664.6	118	3,112	146	3,261	477	4,063	-11,591,716	-4,583,001	0.0015	0.2529
108	207	711	0%	24%	0.0	-2,670.6	119	3,112	140	3,324	519	3,899	-11,744,699	-4,569,141	0.0015	0.2590
109	197	738	18%	43%	0.0	-2,653.8	124	3,112	143	3,200	368	4,179	-11,675,923	-4,600,356	0.0015	0.2470
110	197	724	11%	39%	0.0	-2,662.3	118	3,112	141	3,233	419	4,118	-11,711,240	-4,591,440	0.0015	0.2501
111	197	710	0%	26%	0.0	-2,671.2	112	3,112	134	3,314	494	3,924	-11,896,288	-4,572,911	0.0014	0.2580
112	192	710	0%	21%	0.0	-2,670.8	110	3,112	129	3,333	478	3,868	-12,067,201	-4,570,778	0.0014	0.2597
113	174	814	74%	67%	0.0	-2,606.7	139	3,112	139	3,112	197	4,736	-12,275,418	-4,753,606	0.0011	0.2012
114	156	723	18%	43%	0.0	-2,662.8	98	3,112	113	3,195	292	4,172	-12,529,872	-4,610,144	0.0011	0.2461
115	138	749	43%	54%	0.0	-2,646.8	96	3,112	100	3,112	153	4,395	-13,034,933	-4,656,915	0.0009	0.2321
116	121	776	78%	71%	0.0	-2,630.1	98	3,112	98	3,112	138	4,783	-13,779,409	-4,803,219	0.0007	0.1908
117	108	711	0%	17%	0.0	-2,670.6	63	3,112	73	3,348	261	3,814	-14,428,439	-4,592,803	0.0007	0.2597
118	85	710	0%	27%	0.0	-2,670.8	49	3,112	58	3,311	212	3,934	-15,303,253	-4,609,515	0.0005	0.2557

Table A-4 - Sensitivity Analysis

Country	Average Labor Supply		Demogrant		Gini Coefficients Labor Income		Gini Coefficients Consumption		Average Labor Supply		Unemployment		Average Consumption		Average Labor Income		Revenue	
	dec.	WIT	dec.	WIT	dec.	WIT	dec.	WIT	dec.	WIT	dec.	WIT	dec.	WIT	dec.	WIT	dec.	WIT
v=0.5																				
World	0.36	0.60	1,329	3,061	0.75	0.79	0.69	0.26	0.23	0.09	1%	13%	5,266	5,067	5,266	5,067	0.0	0.0
6 United States	0.30	0.60	9,244	3,061	0.41	0.44	0.29	0.35	0.27	0.30	0%	0%	30,569	15,655	30,569	31,811	0.0	16,155.7
36 Poland	0.21	0.60	913	3,061	0.31	0.44	0.24	0.08	0.31	0.08	0%	0%	4,275	3,749	4,275	1,739	0.0	-2,010.4
88 India	0.43	0.60	172	3,061	0.58	0.52	0.33	0.04	0.20	0.04	0%	21%	404	3,342	404	709	0.0	-2,632.5
v=2.0																				
World	0.41	0.62	1,539	3,112	0.75	0.79	0.69	0.25	0.21	0.09	2%	15%	5,027	5,016	5,027	5,016	0.0	0.0
6 United States	0.36	0.62	10,373	3,112	0.43	0.44	0.28	0.35	0.25	0.29	0%	0%	29,058	15,072	29,058	31,504	0.0	16,432.0
36 Poland	0.28	0.62	1,127	3,112	0.32	0.45	0.23	0.08	0.28	0.08	0%	0%	4,041	3,737	4,041	1,646	0.0	-2,090.2
88 India	0.47	0.62	182	3,112	0.60	0.53	0.32	0.04	0.18	0.04	0%	23%	388	3,384	388	718	0.0	-2,666.2
v=5.0																				
World	0.45	0.64	1,722	3,162	0.76	0.79	0.69	0.24	0.19	0.08	2%	16%	4,778	4,955	4,778	4,955	0.0	0.0
6 United States	0.41	0.64	11,252	3,162	0.45	0.45	0.26	0.35	0.23	0.29	0%	0%	27,598	14,433	27,598	31,147	0.0	16,713.8
36 Poland	0.33	0.64	1,280	3,162	0.34	0.45	0.23	0.07	0.26	0.07	0%	1%	3,837	3,722	3,837	1,548	0.0	-2,174.2
88 India	0.51	0.64	189	3,162	0.61	0.55	0.30	0.04	0.16	0.04	0%	25%	374	3,425	374	725	0.0	-2,699.5

	Non-Tradables Average		Non-Tradables Price		PPP		Consumption Percentiles 5%		50%		95%		Average Welfare		U.S. Welfare Weights	
	dec.	WIT	dec.	WIT	dec.	WIT	dec.	WIT	dec.	WIT	dec.	WIT	dec.	WIT	dec.	WIT
v=0.5																		
World	0.24	0.13	3,290	7,412			574	5,046	1,677	6,292	29,970	14,595	0.0007842	0.0009587	0.1982	0.4266
6 United States	0.38	0.26	17,033	12,504	1.00	1.00	17,691	7,077	21,167	11,203	70,509	39,202	0.0012300	0.0010700	1.0000	1.0000
36 Poland	0.31	0.15	2,941	5,351	0.57	0.68	2,641	3,243	3,390	3,513	8,714	5,349	0.0009000	0.0009500	0.2018	0.3506
88 India	0.20	0.10	434	6,744	0.33	0.76	223	3,061	265	3,288	1,031	3,848	0.0006500	0.0009400	0.0235	0.3201
v=2.0																		
World	0.22	0.13	3,371	7,687			566	4,962	1,599	6,198	28,784	14,043	-7564213	-4384246	0.1591	0.3795
6 United States	0.35	0.25	17,525	12,467	1.00	1.00	17,373	6,835	20,198	10,808	65,683	37,657	-2698305	-3608738	1.0000	1.0000
36 Poland	0.28	0.14	2,992	5,578	0.57	0.69	2,566	3,261	3,216	3,531	8,097	5,195	-4961715	-4422498	0.0802	0.2933
88 India	0.18	0.10	456	7,100	0.33	0.78	222	3,112	263	3,327	963	3,892	-9720412	-4542144	0.0035	0.2609
v=5.0																		
World	0.20	0.12	3,458	8,006			561	4,864	1,527	6,081	27,408	13,433	-1.52943E+27	-9.56376E+25	0.1385	0.3273
6 United States	0.32	0.24	18,063	12,428	1.00	1.00	17,014	6,570	19,233	10,375	61,132	35,966	-1.41054E+25	-5.04691E+25	1.0000	1.0000
36 Poland	0.27	0.13	3,042	5,846	0.57	0.70	2,493	3,277	3,060	3,548	7,572	5,024	-1.60721E+26	-9.56694E+25	0.0129	0.2245
88 India	0.17	0.10	477	7,509	0.34	0.80	221	3,162	261	3,363	905	3,933	-2.35890E+27	-1.05833E+26	0.0001	0.1883

Figure 1: Optimal Tax Functions - PPP model

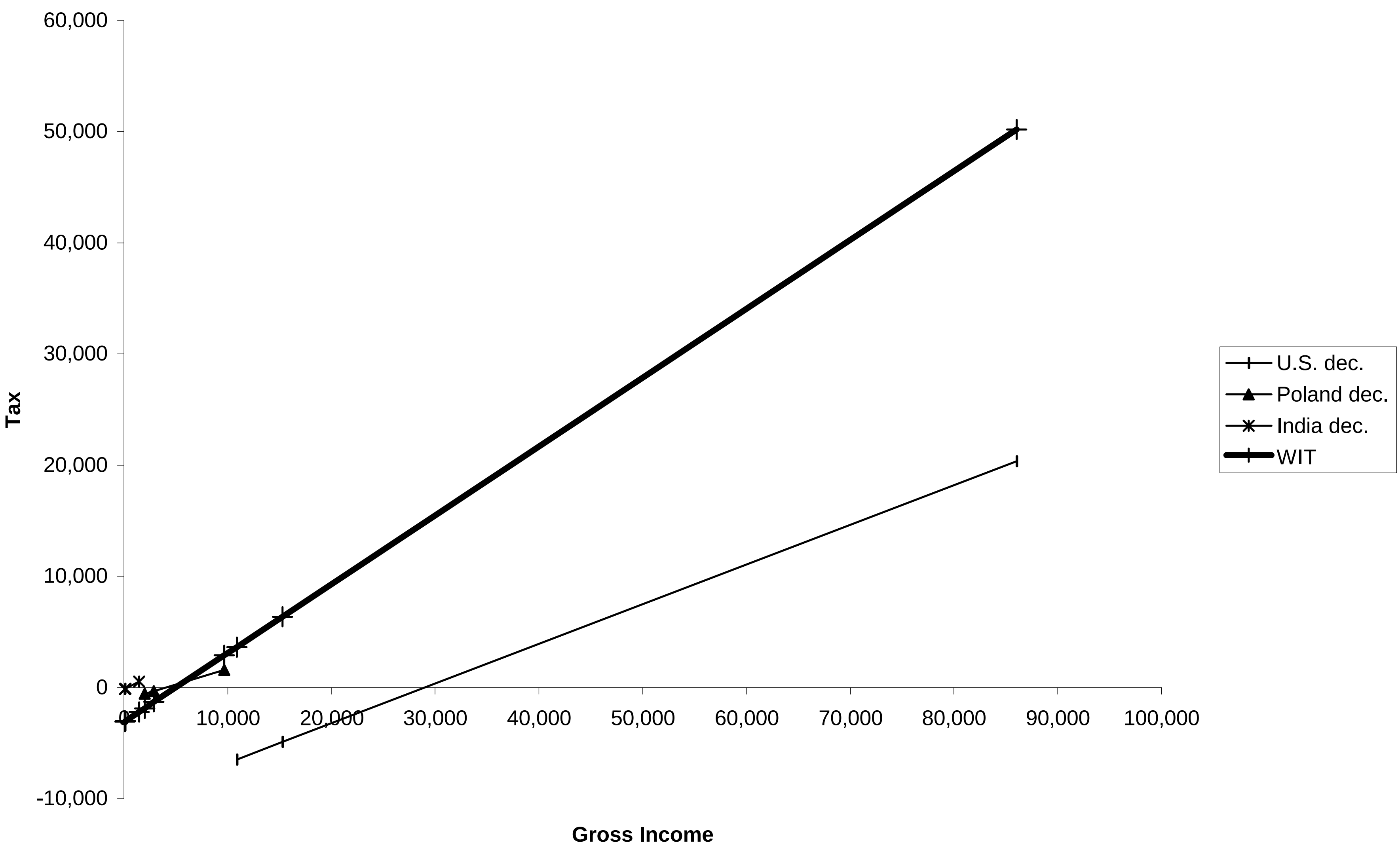

Figure 2: Actual vs. Calibrated PPP

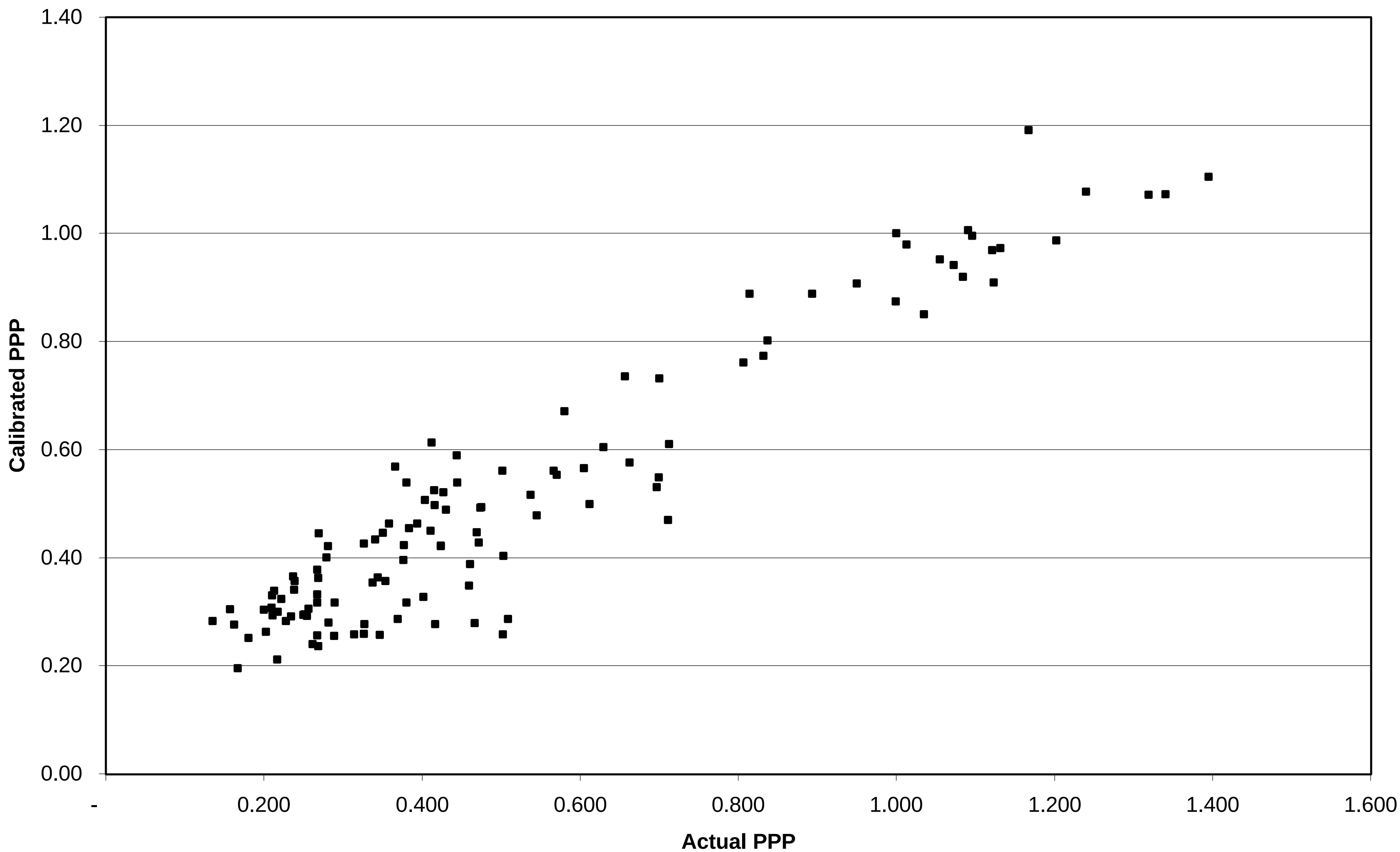

Figure 3: Income vs. PPP