ANALYSES OF POVERTY AND INCOME REDISTRIBUTION: SOME LESSIONS FROM GAMES AND MULTI-HOUSEHOLD MULTI-SECTORAL DYNAMIC EQUILIBRIUM MODELS

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Abstract

Alleviating the level of poverty - the problem of malnourishment, hunger-disease-illness, illiteracy, lack of education and skills - has remained one of the major policy issues in the UK and other OECD economies in the last century and many developing economies in the last five decades. This paper assesses theoretical contribution in measurement of poverty in terms of Atkinson-Sen indices of poverty and statistical measurements in Booth-Rowntree tradition and proposes a strategic and multisectoral multi-household dynamic general equilibrium models for poverty alleviation. It is argued that poverty alleviation requires cooperation from rich, who pay taxes, from poor themselves with sufficient motivations for skill enhancement and precautions against unforeseeable future and the government which implements poverty reduction programmes. These programmes fail to achieve such objective in absence of trust and cooperation among these three sections of the community. General equilibrium analysis is suitable for analysing their behaviour in a coherent way and to assess the impact of policy measures such as the flat tax. Model is applied for Nepal, the UK and the US to show that such measures only may not have significant effect in alleviating poverty. Poverty reduction requires policies that create human or physical capital assets for the low income households.

Key words: Poverty, redistribution, dynamic model

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I. Introduction

Poverty is a relative concept irrespective to the level of development of an economy. For Adam Smith (1776) poverty meant:

"... not only the commodities which are indispensably necessary of the support of life but whatever the custom of the country renders it indecent for creditable people ... to be without. A linen shirt is strictly speaking not a necessity of life. The Greeks and Romans lived very comfortably though they had no linen. But in the present time ... a creditable day-laborer would be ashamed to appear in public without a linen shirt..."[2].

Marx also noted `necessary wants of the workers as the product of historical development that depended to a great extent on the degree of civilization of the country'[3]. The absolute concept to poverty was first formally used by Rowntree (1899) in a study of minimum living standard for a respectable life in York in Britain more than a hundred years ago[4]. In his study a family was considered to be living in poverty if its total earnings were insufficient to obtain the minimum necessaries for the maintenance of merely physical needs. In 1899, taking American nutritionist Atwater's estimate on the minimum requirements of protein and calories, Rowntree calculated a daily food expenditure on porridge and skim milk for breakfast, bread and cheese for lunch, vegetable broth, bread, cheese, dumpling for dinner, and bread and porridge for supper. All these would cost 5s 6d for a single person, 9s 2d for a couple, and 10s 6d for a couple with four children, with the addition in each of rent paid. Orshansky (1965) did similar study for the United States. Critically assessing both of these studies on measurement of poverty Atkinson (1970) concluded that ".. poverty line cannot be defined in a vacuum, but only in relation to a particular society at a particular date". An accurate measurement of poverty has been an issue of theoretical investigation since then (Sen (1976), Foster and Shorrocks (1985), Basu (1985), Vaughan (1987), Preston (1995), Shorrocks (1995) and Chakravarty (1997), Davidson and Duclos (2000)). As research

[2]. Quoted in A. K. Sen's (1983), `Poor, Relatively Speaking' Oxford Economic Papers 35, p.161.

[3]. Quoted by Atkinson (1988), The Economics of Inequality, OUP, London, p189.

[4]. See Glennester, Huills, Piachaud and Webb (2004) for a historical account on the measurement of poverty in Great Britain.

progressed the head-count and the income-gap ratios, two widely used measures of poverty by Rowntree (1901) and Townsend (1954, 1979) were thought inadequate to reflect the effect of intra-group transfers. Sen (1976)[5] suggested an ordinal approach for measurement of poverty that would fulfill the axioms of monotonicity, transfer, relative equity, ordinal rank and monotonic welfare. Many more empirical studies have appeared recently that aim to justify and monitor programmes aimed at reducing poverty, such as the poverty reduction strategy framework under the Millennium Development Goals (OECD (1976), UNDP (1991), Slesnick (1996), World Bank (1991), Ravallion (1996), Stifel and Thorbekcek (2003)).

II. A Numerical Example on the Measurement and Alleviation of Poverty

Consider an economy inhabited by N number of individuals where income of each is denoted by y_i for each i = 1,2, …, N. Income vary among individuals for economic, social, political, cultural or many other less obvious reasons; $y_i \neq y_j$ for all $\forall_i$. A strict ordering implies $y_1 < y_2 < .. < y_N$, with corresponding ordering of welfare with lower income individuals having lower level of welfare. Infinite numbers of income configurations (distributions) are possible which often are summarised by their mean and variances. Some distributions, with lower variances, are more equal than others. Poverty line relates to average income of individuals; particularly with questions such as how many people fall below the average income, $\bar{y} = \sum_{i}^{N} \frac{y_i}{N}$ or how many of them are above this level of income. Many countries adopt one half of the average income as a cut-off point for absolute poverty line; $z = \frac{1}{2}\bar{y}$, which is then used to come up with either the head count ratio, which is the ratio of number of people below the poverty line divided by the total number of individuals in the

[5] Sen (1988), `Poverty: An Ordinal Approach to Measurement', Oxford University Paper, pp.219-231.

population. The head count ratio is however not an adequate indicator. It cannot show the depth of poverty. Income gap ratio, which is given by the deficiency of income of individuals to reach the poverty gap $I = \frac{\sum_{i}^{n}(y_i - z)}{z.n}$ measures the depth of poverty. Sen (1976) argues that even this indicator violates the monotonicity assumption as it is insensitive to transfer from poorest poor to less poor person and proposes further refinement of this in a measure of poverty that takes account of this distribution as:

$$P = H.I + (1 - I)G \qquad (1)$$

Here P is a composite poverty index of poverty, H the headcount ratio, I the income gap ratio, G the Gini coefficient; higher values of H, I, and G means greater degree of poverty. Consider the following table for a numerical example that can illustrate these concepts more accurately.

Table 1
Measuring Poverty in a hypothetical economy

y	N	cy	cp	yshre	cyshre	pshare	cpshare	triangle	Rectangle	Area	ygap
10	1	10	1	0.01	0.01	0.1	0.1	0.0005	0	0.0005	-90
20	1	30	2	0.02	0.03	0.1	0.2	0.001	0.001	0.002	-80
30	1	60	3	0.03	0.06	0.1	0.3	0.0015	0.003	0.0045	-70
40	1	100	4	0.04	0.1	0.1	0.4	0.002	0.006	0.008	-60
50	1	150	5	0.05	0.15	0.1	0.5	0.0025	0.01	0.0125	-50
60	1	210	6	0.06	0.21	0.1	0.6	0.003	0.015	0.018	-40
90	1	300	7	0.09	0.3	0.1	0.7	0.0045	0.021	0.0255	-10
100	1	400	8	0.1	0.4	0.1	0.8	0.005	0.03	0.035	0
200	1	600	9	0.2	0.6	0.1	0.9	0.01	0.04	0.05	100
400	1	1000	10	0.4	1	0.1	1	0.02	0.06	0.08	300

Column **y** gives the income by households, ***N*** the number of households in each income category, **cy** and **cp** are cumulative income and population; **yshre** and **cyshre** columns present income share of each decile and cumulative shares; **pshre** and **cpshre** columns present income share of each decile and cumulative shares; area under the Lorenz curve is approximated using triangle and rectangles.

The total income is 1000, with 10 households, average income is 100. Area under the Lorenz curve is 0.236, that between the Lorenz curve and equality line is

0.264; this implies a Gini coefficient of 0.528; higher **G** reflecting more unequal distribution.

By the headcount ratio seventy percent of population is poor if the accepted poverty line is the average income $\bar{y} = 100$ but only 40 percent is poor when absolute poverty line is established as the half of this average income $z = \frac{1}{2}\bar{y} = 50$ as only four individuals are below the poverty line. As stated above this head count ratio does not indicate the depth of poverty. The income gap ratio,

$I = \frac{\sum_{i}^{n}(y_i - z)}{z.n} = \frac{40+30+20+10}{50 \cdot 4} = \frac{100}{200} = 0.5$. In terms of Sen's poverty index, poverty in this economy is

$$P = H.I + (1-I)G = 0.4 \times 0.5 + (1-0.5)0.528 = 0.2 + 0.264 = 0.464$$

This index would have larger value if the income distribution was more unequal. The elimination of the absolute poverty in this example requires transfers of 100 to poor individuals with $T_1 = 40$ for the poorest household and $T_2 = 30, T_3 = 20$ and $T_4 = 10$ accordingly to other other three households below the poverty line. This transfer can be funded by a 10 percent and 20 percent tax on the income of 9th and 10th deciles raising 20 and 80 respectively. This brings *H* to zero and *I* to 1 making *P* to zero (see Appendix 1 for cross country comparisons, Appenix 2 for UK income distribution and Appendix 3 for the Social Accounting Matrix of the US, Appendices 5 and 6 for input-output tables of Nepal and UK economies respectively).

It is obvious that the value of poverty index is influenced by the choice of the poverty line. When income is perfectly equally distributed no one is below poverty line with *H* zero and *G* also equals zero with no poverty, *P* = 0; but these are extreme cases only of theoretical possibility. In the real world, values of *P* range between zero and one, $0 < P < 1$, with higher *P* indicating to the higher level of poverty. This means when looked from this point of view, the poverty is everywhere, in relative sense

there are poor in every society. Variation in the level of poverty emanates from the basic structure of the socio-economic model adopted by the country.

Poverty measure us sensitive the choice of the poverty line. There is more poverty in the economy when the mean of the income is taken as a poverty line than when the half of the income is taken for it. A more unequal society has greater poverty than the more equal society. More fundamentally the degree and depth of poverty can be changed by influencing the choices of individuals and households and by adopting economic programmes that are more efficient and generate best outcome.

It is often argued that poverty can be eliminated by means of tax and transfer as illustrated in the numerical example in Table 1. Broader questions arise regarding the impact of such transfer programme. First relates to its impact on labour supply of rich and poor. Higher taxes may discourage rich individuals to work and transfer receipts may reduce the need to work to earn for living for poor. Secondly, higher taxes may discourage incentives of saving and investment. Third, modality of transfer payment may be crucial for long term growth. Providing in kind transfer in the form of education and health spending may be better than cash transfers to empower productive capacity of poor. Fourth, in addition to transfer payment government needs to provide public goods for the entire population. As everyone consumes the public goods these should be provided by taxing on income of both rich and poor.

III. Game of Poverty

Limitations of one time transfers to end poverty have made alleviation of poverty one of the major global agenda in recent years (Millennium Development Goals (MDG), G8 meeting and Live 8 concerts 2005; poverty alleviations strategies of many developing economies including the OECD, China and India). As mentioned above poverty is not only the problem of developing economies but also of advanced economies. Effective implementation of these require strategic thinking among three major players in the poverty game; poor themselves who are often considered

beneficiaries of aids, grants and transfers, rich individuals who bear the burden of taxes to pay for those transfers and the government that is involved not only in determining the depth of poverty and setting objectives, targets and programmes that aim to eliminate poverty but also is subject to corruption and misuse of public money. This effectively involves designing an effective incentive structure in the economy and the balance of economic and political power among these three players.

Ideally high income individuals would like to see the end of poverty as has been campaigned by public and private sectors in advanced countries in recent year. In the mean time they also expect that poor who receive benefit should make good efforts to get out of the poverty trap by investing their time and resources in education, skill and training and health care taking a longer time view rather than taking transfers to pay only for current spending. Government, made of representatives of both poor and rich people, might bring very sound and ideal programmes and propose rules and regulations but they become ineffective in removing poverty if there is not enough cooperation from tax payers and the recipients of the aid. A small game theoretic model is presented here to explain the dynamic situation of poverty. The solutions differ when all players use cooperative strategy and when they play a non-cooperative strategy. In a utility or welfare maximising world, model results will be based on comparison of expected welfare in each strategy.

Model of the Poverty Game

Each player in the model (poor, rich and government) has a set of strategies available to it (s,l, and k respectively). The outcome of the game is the strategy contingent income for poor and rich, $y_t^p(s,l,k)$ and $y_t^R(s,l,k)$. The probability of being in particular state like this is given by $\pi_t^p(s,l,k)$ and $\pi_t^R(s,l,k)$ respectively. The state-space of the game rises exponentially with the length of time period t. The objective of these two players is to maximize the expected utility and government can

influence this outcome by means of taxes and transfers. More specifically, following conditions should hold in this poverty alleviation game.

Condition 1: The state contingent money metric expected utility of poor is less than that of rich, which can be expressed as:

$$\sum_{s=1}^{s}\sum_{l=1}^{l}\sum_{k=1}^{k}\sum_{t}^{T}\pi_t^p(s,l,k)\cdot\delta_t^p u\left(y_t^p(s,l,k)\right)<\sum_{s=1}^{s}\sum_{l=1}^{l}\sum_{k=1}^{k}\sum_{t}^{T}\pi_t^R(s,l,k)\cdot\delta_t^R u\left(y_t^R(s,l,k)\right)$$

where $\pi_t^p(s,l,k)$ gives the probability of choosing one of strategies by poor given that the rich and the government has chosen l and k strategies. Utility is derived from income as given by $u\left(y_t^p(s,l,k)\right)$ and $\delta_t^p=\frac{1}{\left(1+r_t^P\right)}$ is the discount factors for poor and $\delta_t^R=\frac{1}{\left(1+r_t^R\right)}$ the discount factor for rich.

Condition 2: Transfer raises money metric expected utility of poor and reduces the utility of rich.

$$\sum_{s=1}^{s}\sum_{l=1}^{l}\sum_{k=1}^{k}\sum_{t}^{T}\pi_t^p(s,l,k)\cdot\delta_t^p u\left(y_t^p(s,l,k)+T_t^p(s,l,k)\right)<\sum_{s=1}^{s}\sum_{l=1}^{l}\sum_{k=1}^{k}\sum_{t}^{T}\pi_t^R(s,l,k)\cdot\delta_t^R u\left(y_t^R(s,l,k)-T_t^p(s,l,k)\right)$$

Condition 3: Incentive compatibility requires that

$$\sum_{s=1}^{s}\sum_{l=1}^{l}\sum_{k=1}^{k}\sum_{t}^{T}\pi_t^p(s,l,k)\cdot\delta_t^p u\left(y_t^p(s,l,k)+T_t^p(s,l,k)\right)>\sum_{s=1}^{s}\sum_{l=1}^{l}\sum_{k=1}^{k}\sum_{t}^{T}\pi_t^p(s,l,k)\cdot\delta_t^p u\left(y_t^p(s,l,k)\right)$$

and

$$\sum_{s=1}^{s}\sum_{l=1}^{l}\sum_{k=1}^{k}\sum_{t}^{T}\pi_t^R(s,l,k)\cdot\delta_t^R u\left(y_t^R(s,l,k)-T_t^p(s,l,k)\right)<\sum_{s=1}^{s}\sum_{l=1}^{l}\sum_{k=1}^{k}\sum_{t}^{T}\pi_t^R(s,l,k)\cdot\delta_t^R u\left(y_t^R(s,l,k)\right)$$

Condition 4: Growth requires that income of both poor and rich are rising over time:

$$T_t^p(s,l,k)<T_{t+1}^p(s,l,k)<T_{t+2}^p(s,l,k)<..<T_{t+T}^p(s,l,k)$$

$$Y_t^p(s,l,k)<Y_{t+1}^p(s,l,k)<Y_{t+2}^p(s,l,k)<..<Y_{t+T}^p(s,l,k)$$

$$Y_t^R(s,l,k)<Y_{t+1}^R(s,l,k)<Y_{t+2}^R(s,l,k)<..<Y_{t+T}^R(s,l,k)$$

Condition 5: Termination of poverty requires that every poor individual has at least the level of income equal to the poverty line determined by the society. When the poverty line is defined one half of the average income this can be stated as:

$$Y^{p}_{t+T}(s,l,k) \geq \frac{1}{2}\sum_{p=1}^{p} Y^{p}_{t+T}(s,l,k)$$

Above five conditions comprehensively incorporate all possible scenarios in the Poverty Game mentioned above. Conditions 2-5 present optimistic scenarios for a chosen horizon *T*.

Testing above propositions in a real world situation is very challenging exercise. It requires modelling of the entire state space of the economy. Moreover in real situation economy is more complicated than depicted in the model above. Many households with different endowment of labour and capital supply factors to many producers across agricultural, manufacturing, production or service sectors of the economy with government in possession of vaious instruments to guide the choices of those consumers and producers in the economy. In essence it requires a general equilibrium set up of an economy where poor and rich households participate freely in economic activities taking their share of income received from supplying labour and capital inputs that are affected by tax and transfer system. This aspect modelling is briefly specified in the next section and examined in details using the general equilibrium models of three different economies: Nepal, UK and USA in section V. These dynamic multi-household-multi-sectoral computable general equilibrium models are solved using the GAMS/MPSGE software (Rutherford (1998)).

IV. Poverty in Multi-sectoral multi-household dynamic general equilibrium model

Poverty reduction strategy requires a thorough appreciation of the production as well as the consumption sides of the economy and the structure of the markets, government and the foreign sectors. This section aims to present a simple multi-

household multi-sectoral computable dynamic general equilibrium model in which the government uses taxes and spending strategy to alleviate the depth of poverty. It is possible to evaluate the life time welfare of households and evaluate the impacts of public policy in redistribution of income using this framework.

The models of Nepal and the economies consist of ten different households, $h_1 \ldots h_{10}$ ranked according to their income status, 10 different firms $i_1 \ldots i_{10}$, a government that collects taxes from labour and capital income taxes on use of inputs and household income taxes and tariffs and the rest of the world sector. The US model consist seven categories of households. The growth of the economy and distribution of income among households depends on the capital accumulation process and growth rate of productivity of labour force.

It is impossible to have an explicit analytical solution for a big model like this therefore numerical technique is used to solve the model. Household preferences and technology of firms are similar to those in Bhattarai (2005).

$$\text{Max } U_0^h = \sum_{t=0}^{\infty} \beta^t U_t^h \left(C_t^h, l_t^h\right)$$

Subject to

$$\sum_{t=0}^{\infty} R_t^{-1} \left[P_t (1+t^{vc}) C_t^h + w_t (1-t_l) l_t^h\right] = \sum_{t=0}^{\infty} \left[(1-t_l) w_t L_t^h + (1-t_k) r_t K_t^h + TR_t^h\right]$$

where C_t^h, l_t^h and L_t^h are respectively composite consumption, leisure and labour supplies of household h in period t, $R_t^{-1} = \prod_{s=0}^{t-1} 1/(1+r_s)$ is a discount factor; r_s represents the real interest rate on assets at time s; t^{vc} is value added tax on consumption, t^l is labour income taxes, and K_t^h is the composite consumption, which is composed of sectoral consumption goods, P_t is the price of composite consumption (which is based on goods' prices), i.e. $P_t = \vartheta \prod_{i=1}^{n} \alpha_i p_{i,t}^{\alpha_i}$, and $C_t^h = \prod_{i=1}^{n} C_{i,t}^{\alpha_i^h}$.

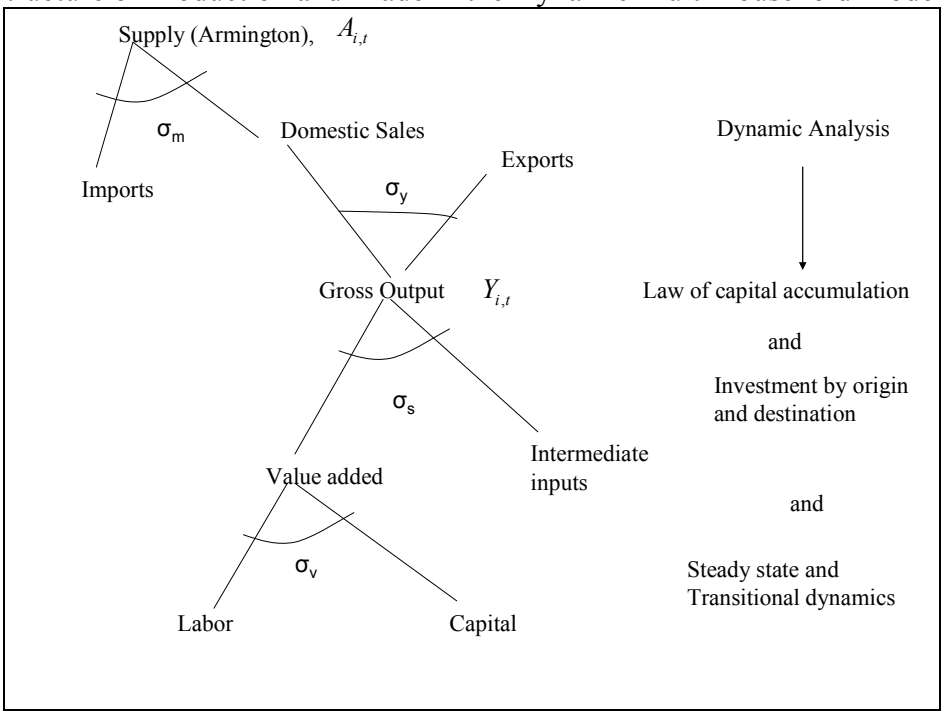
Industries of the economy are represented by firms that combine both capital and labour input in production and supply goods and services to the market.

$$\Pi^{y}_{j,t} = [((1-\delta^{e}_{i})PD^{\frac{\sigma_y-1}{\sigma_y}}_{i,t} + \delta^{e}_{i}PE^{\frac{\sigma_y-1}{\sigma_y}}_{i,t})]^{\frac{1}{\sigma_y-1}} - \theta^{v}_{j}PY^{v}_{j,t} - \theta^{d}_{j}\sum_{i} a^{d}_{i,j}P_{i,t}$$

where: $\Pi^{y}_{j,t}$ is the unit profit of activity in sector j; $PE_{j,t}$ is the export price of good j $PD_{j,t}$ is the domestic price of good j; $PY^{v}_{j,t}$ is the price of value added per unit of output in activity j; σ_y is a transformation elasticity parameter ; $P_{i,t}$ is the price of final goods used as intermediate goods; δ^{e}_{j} is the share parameter for exports in total production; θ^{v}_{j} is the share of costs paid to labour and capital; θ^{d}_{j} is the cost share of domestic intermediate inputs; $a^{d}_{i,j}$ are input-output coefficients for domestic supply of intermediate goods.

These are open economy models in which goods produced at home and foreign countries are considered closed substitutes, Armington assumption, popular in the applied general equilibrium literature and the production process is given by a nested production and trade functions.

Figure 1
Structure of Production and Trade in the Dynamic Multi-household Models



The households pay taxes to the government and government returns part of this income to the poor households and spends rest of it to provide public services.

$$REV_t = \sum_{i,h} t_i^k r_t K_{i,t} + \sum_i t_i^{vc} P_{i,t} C_{i,t}^h + \sum_i t_i^{vg} P_{i,t} G_{i,t} + \sum_i t_i^{vk} P_{i,t} I_{i,t} + \sum_{i,h} t_l wLS_t^h + \sum_i t_i^m PM_{i,t} M_{i,t} + \sum_i t_i^p P_{i,t} GY_{i,t} \quad (25)$$

where REV_t is total government revenue and t_i^k is a composite tax rate on capital income from sector I, t_l^{vc} is the *ad valorem* tax rate on final consumption by households, t_i^{vg} is that on public consumption and t_i^{vk} is the ad valorem tax rate on investment, t_l is the tax rate on labour income of the household, t_i^p is the tax on production, and t_i^m is the tariff on imports.

The steady equilibrium growth path of the economy is determined in terms of the interest rate, discount factor and relative prices of goods and factors in which the excess demand for goods and factors are eliminated and resource balance condition holds for the economy and each household and the government and rest of the world sectors in each period and over the model horizon. It also shows how the income of each type of household evolves over time as a function of the relative prices of goods and share of households in income. Government transfers can alter this equilibrium.

V. Calibration

Above model is applied to the Nepal and UK and US economies to study the income distribution impact of public policy among the households of the various groups with dynamics as in Bhattarai (2005). The issue of labour-leisure choice analysed in the static context in Bhattarai and Whalley (1999) takes inter-temporal dimension in this model. The micro-consistency in the model is obtained by construction, the demand and supply sides balance for each sector in an input-output model, the income of households equals consumption plus saving, and investment equals total of savings by the households.

Table 2

Sectoral share of consumption by households α_i^h

	Agric	Min	Manu	Utils	Const	Distb	Trans	Busi	OthSect
H1	0.018	0.018	0.018	0.018	0.018	0.018	0.018	0.018	0.018
H2	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026
h3	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041
h4	0.057	0.057	0.057	0.057	0.057	0.057	0.057	0.057	0.057
h5	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074
h6	0.094	0.094	0.094	0.094	0.094	0.094	0.094	0.094	0.094
h7	0.111	0.111	0.111	0.111	0.111	0.111	0.111	0.111	0.111
h8	0.118	0.118	0.118	0.118	0.118	0.118	0.118	0.118	0.118
h9	0.141	0.141	0.141	0.141	0.141	0.141	0.141	0.141	0.141
h10	0.322	0.322	0.322	0.322	0.322	0.322	0.322	0.322	0.322

The sectoral composition of consumption by households are approximated by the net of tax and transfer income of households and assumed to remain same across all goods as presented in Table 2. In addition based on economic survey data is used for getting the estimates of the distribution of wage, interest rate and transfer income for households.

Table 3

Distribution of wage and interest income, leisure and household tax rate

	H1	h2	H3	h4	H5	h6	h7	H8	h9	h10
Wage	3436	9935	18974	29170	37692	47379	54874	61726	72055	97817
Intr	2682	1370	4257	6006	9155	12975	17115	15599	21022	105197
Leisure	2577	7451	14230	21877	28269	35535	41156	46294	54041	73363
Hit	0	0.05	0.1	0.15	0.2	0.25	0.3	0.35	0.4	0.45

Table 4

Key Parameters of the Model

elasticity of substitution	1.5
growth rate of output	0.02
Benchmark interest rate	0.05
rate of depreciation	0.1
elasticity of intertemporal substitution	1.1

In my knowledge this is the first applied dynamic general equilibrium model of the UK and Nepal economies with the dynamic and multisectoral structure and could be applied to other economies with information on consumption income and labour leisure choice and labour supply as contained in the social accounting matrix of the economy as shown in the SAM for the US economy and Input Output Tables for Nepal and the UK at the appendix.

VI. Policy scenarios

The income redistribution effect in the model occurs through the differentiated tax rates of household income, value added taxes on consumption of goods and services, labour income tax and capital income tax rates. All these tax experiments should constrain the amount of revenue and find the best optimal rates of taxes given that revenue requirement.

Table 5
Labour and capital input taxes in the UK model

	Capial input tax	Labour input tax
Agriculture	-0.0011	-0.0021
Mining and forests	0.0018	0.0188
Manufacturing	0.0106	0.014
Utilities	0.0388	0.1934
Construction	0.0269	0.0041
Distribution	0.0079	0.0107
transports	0.0303	0.0398
Business	0.0121	0.0404
Other Sectors	0.0426	0.0078

Table 6
Labour and capital input taxes in the Nepal model

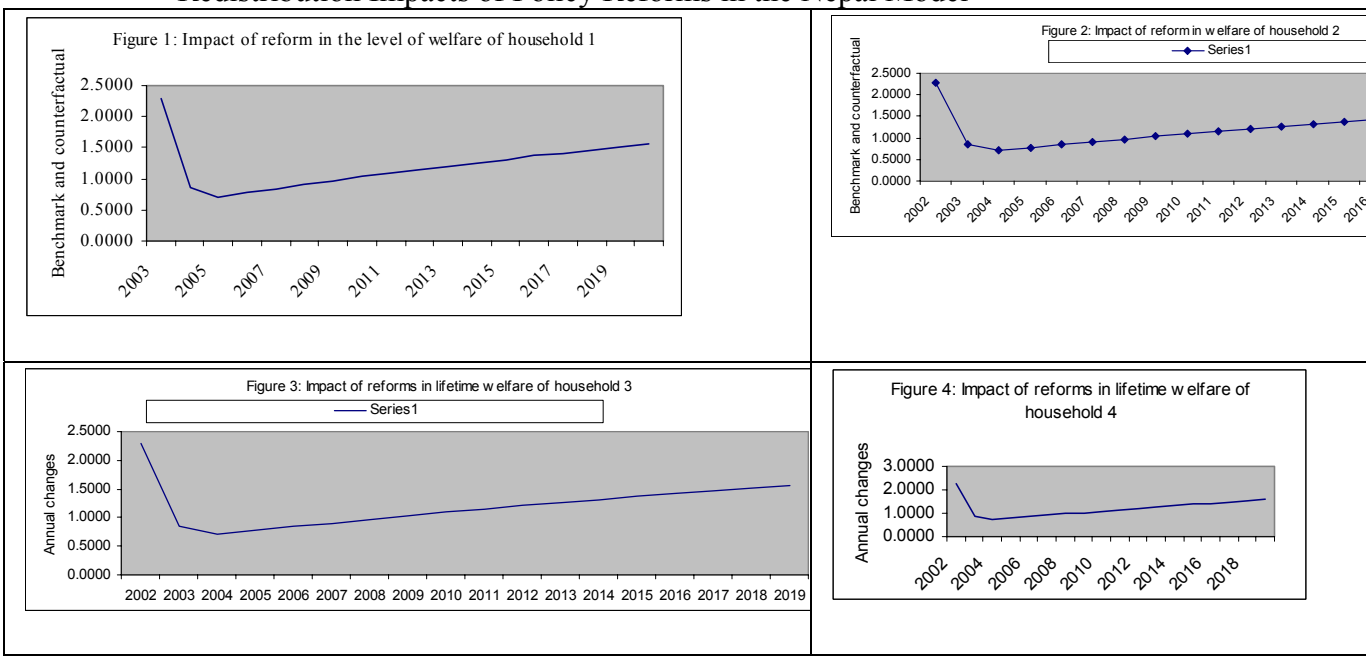
Benchmark Data for Nepal	Tax on labour input	Tax on capital input
agriculture	0.037	0.003
Manufacturing	0.242	0.299
Chemicals	0.482	0.989
Metal	0.088	0.306
Gas electricity and water	0.896	0.014
Hotel	0.279	0.018
Transport and communication	0.642	0.045
Finance	0.075	2.78E-04
Social Services	0.002	0.046

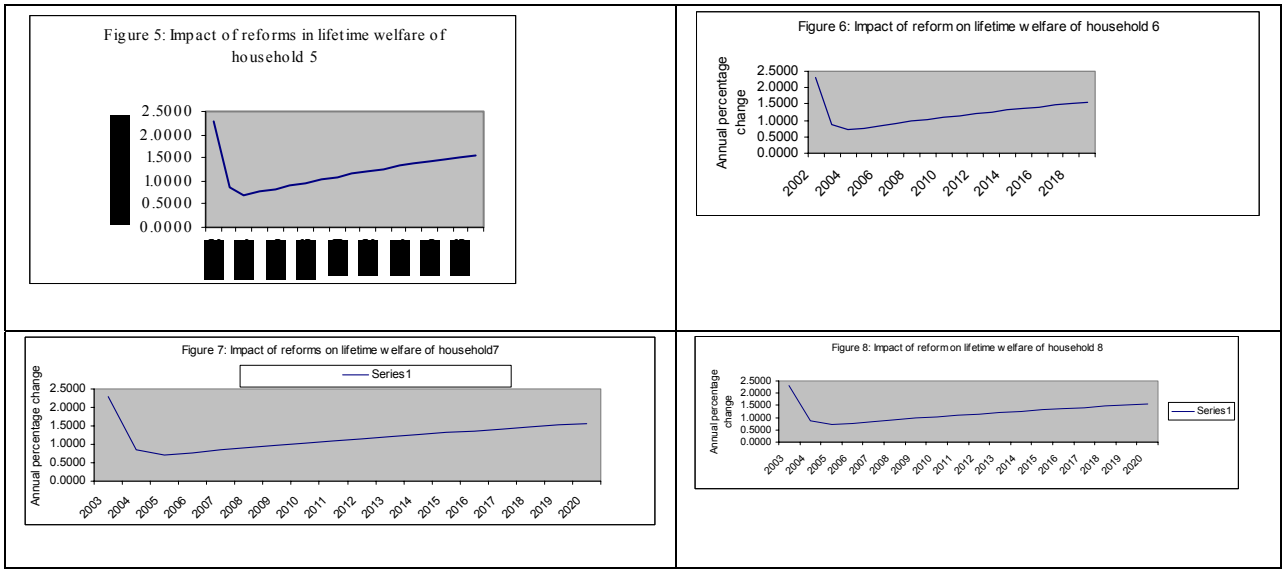
The above benchmark labour and capital input taxes are replaced by uniform rates of 0.3 and 0.2 in the counterfactual scenario. Model solutions show how these reforms affect the distribution income and welfare among households. Results are presented briefly in the following diagrams. The model solutions show that no household gains from such a reform. Implementing a flat tax like this would make poor households even poorer. These results are shown in a series of graphs generated from the benchmark and counterfactual results of these models. These results are preliminary and reflect the income and substitution impacts of policy measures that affect both

product and factor markets in these economies. Various other scenarios are under consideration and are being investigated further.

All the model scenarios arise from growing economies. These systems are distorted in the benchmark and are that are removed under the counterfactual scenarios. Tax reform though important seems to have not very significant impact in developing country like Nepal which requires more investment in physical infrastructure and human capital. Properly designed tax reforms can remove the risk of income uncertainty in the UK as they lead to steady flow of household wellbeing under the counter-factual scenario against the cyclical patterns of income and wellbeing in the benchmark economy. On the other hand the Fair Tax reforms proposals in the US seem to reward households in the low and high income categories where the most the burden of switching to commodity taxes falls up the middle income households.

Figure 2
Redistribution Impacts of Policy Reforms in the Nepal Model





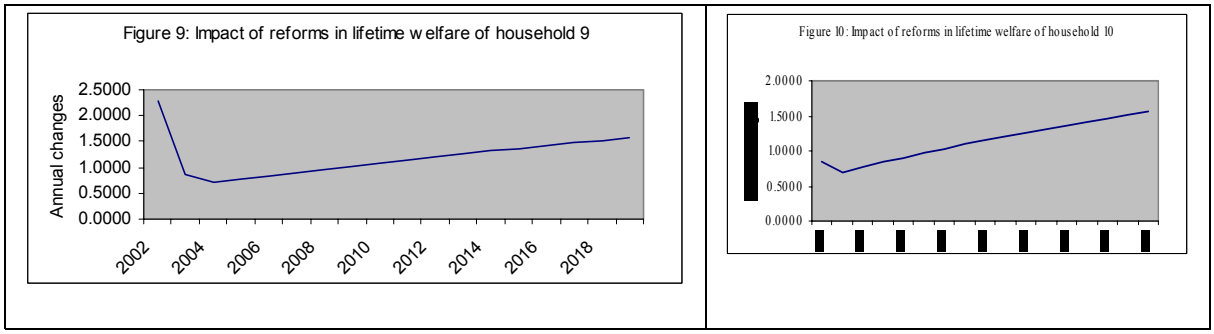
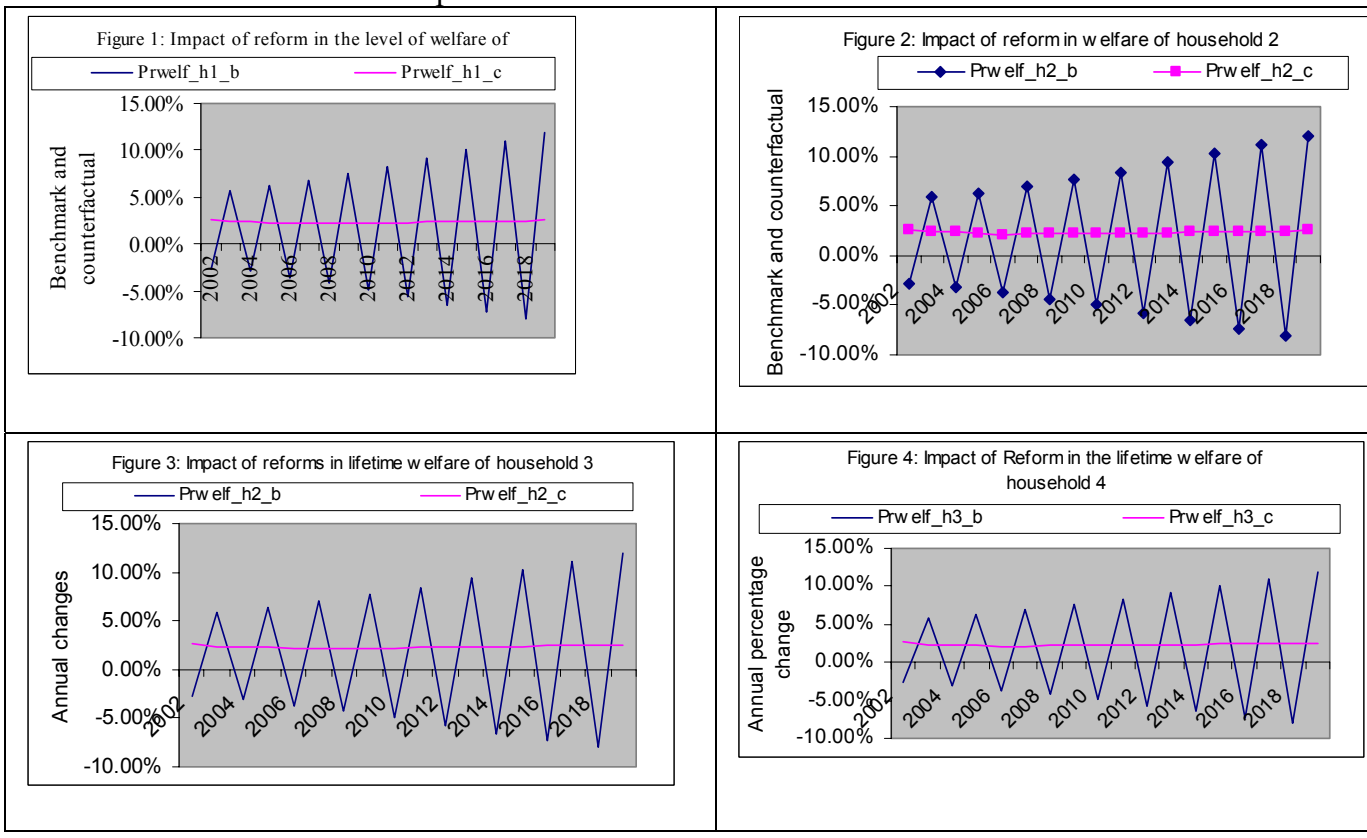


Figure 3
Redistribution Impacts of Tax Reforms in the UK Model



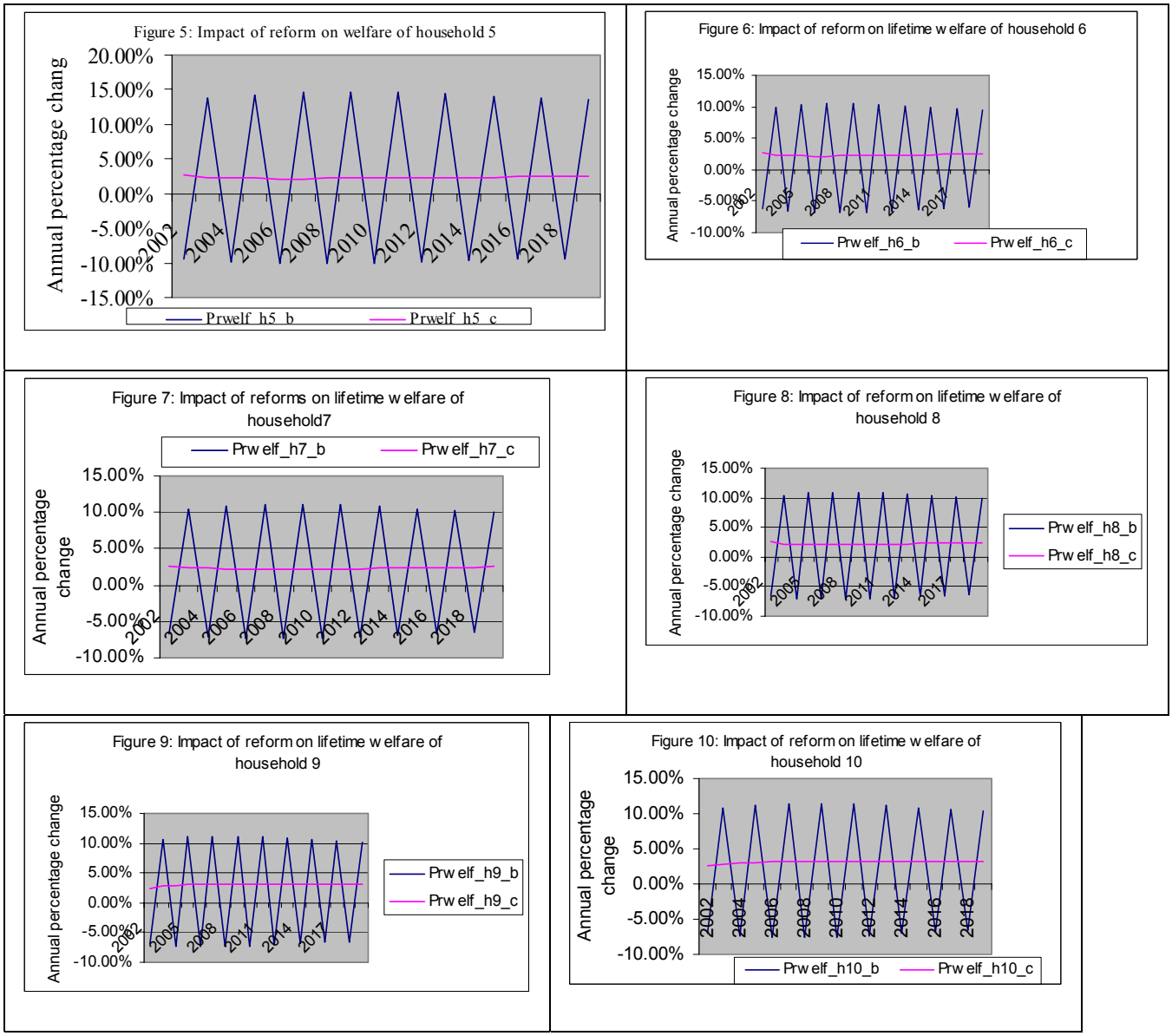
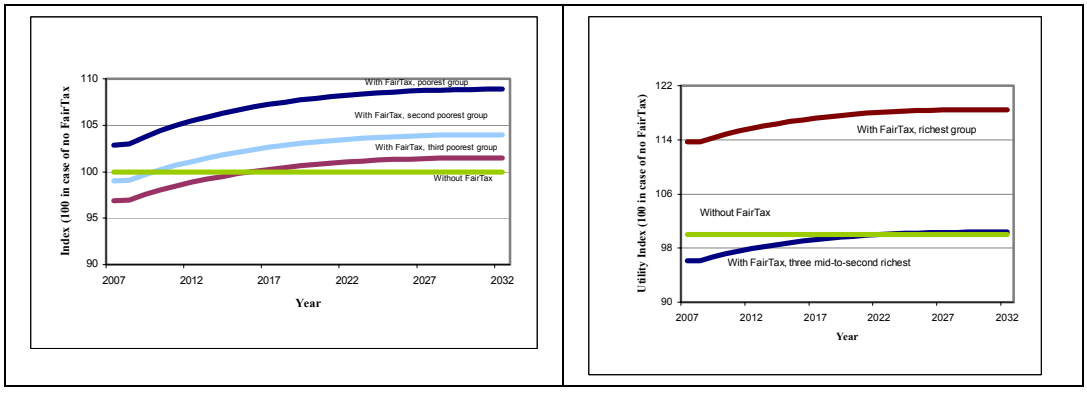


Figure 4
Redistribution Impacts of Tax Reforms in the US Model



The US model is larger than above two models in terms of sectoral specification and included both federal and local governments. The tax experiment involved replacing

all federal indirect taxes by consumption tax and gave the following pattern on the redistribution effects of tax reforms (Tuerck, Haughton, Bhattarai, Ngo and S-Penalvar (2006) for details).

The dynamic models contain a lot more result on the economy than what could be discussed above. They show the evolutionary path for these economies and generate patterns of investment, capital accumulation, employment and output by sectors, relative prices of commodities and factors of production, importable and exportable, government spending and expenditure, composition leisure, consumption and labour supply by households for each model scenario. It is not possible to go in greater details about them here but will be reviewed in subsequent papers.

VI. Conclusion

Alleviating the level of poverty -the problem of malnourishment, hunger-disease-illness, illiteracy, lack of education and skills- has remained one of the major policy issues in the UK and other OECD economies in the last century and many developing economies in the last five decades. This paper assesses theoretical contribution in measurement of poverty in terms of Atkinson-Sen indices of poverty and statistical measurements in Booth-Rowntree tradition and proposes a strategic and multisectoral multi-household general equilibrium models for poverty alleviation. It is argued that poverty alleviation requires cooperation from rich, who pay taxes, from poor themselves with sufficient motivations for skill enhancement and precautions against unforeseeable future and the government which implements poverty reduction programmes not only through tax and transfer system but also spending directly on public services. These programmes fail to achieve such objective in absence of trust and cooperation among these three sections of the community. General equilibrium analysis of tax reform measures such as the flat tax cannot significantly improve the status of poor unless they are accompanied by measures that promote physical and

capital assets among these poor households and change their patters of saving and investment.

VII. References

Atkinson, A. B.:(1970), "On the measurement of inequality", Journal of Economic Theory, 2:3:244-263.

Atkinson, A. B.:(1987), "On the measurement of poverty", Econometrica, 55: 4:749-64 July

Bardhan P. (1996) Efficiency, Equity and Poverty Alleviation: Policy Issues in Less Developed Countries *The Economic Journal* Vol. 106, No. 438 (Sep., 1996), pp. 1344-1356

Bhattarai K and J Whalley (1999) Role of Heterogeneity of Labour Demand in Tax Incidence Analysis *Empirical Economics*, 24:4, pp.599-620.

Bhattarai K (2005) Welfare impacts of equal-yield tax reforms in the UK economy, Applied Economics, forthcoming.

Department of Social Security (1999) Opportunity for all: Tackling Poverty and Social Exclusion - The Changing Welfare State, First Annual Report, cm 4445, London, Stationary Office.

Desai, M. and A. Shah (1988) "An econometric approach to the measurement of poverty", Oxford Economic Papers, v40 p505-22 September.

Davidson, R and J.Y. Duclos (2000) Statistical inference for stochastic dominance and for the measurement of poverty and inequality, Econometrica, 68:6:1435-1464, November.
Foster J. E. and A. F. Shorrocks (1988) Poverty orderings: notes and comments, Econometrica, 56:1:173-177.
Glennester H. J.Huills, D. Piachaud and J. Webb (2004) One hundred years of poverty and policy, Joseph Rawntree Foundation, York, (www.jrf.org.uk).

Jenkins, S.P. (1991) "Poverty measurement and the within-household distribution: agenda for action", Journal of Social Policy v20 p457-83 October.
Myles G.D. (2001) Economic mismeasurement and the bias in policy choice, the Public Economic Theory, 3:2:139-166.
Orshansky M.(1965) Counting the poor: another look at poverty profile, Social Security Bulletin, 28:1:3-29, Jan.
Pyatt G (1987) Measuring welfare, poverty and inequality, Economic Journal, 97:386:459-467.

Preston I. (1995) Sampling distributions of relative poverty statistics, Applied Statistics, 44:1:91-99.

Ravallion M. (1996) Issues in measuring and modeling poverty, *Economic Journal*, 106:438:1328-1343.

Rutherford T.F (1998) Economic Modelling with GAMS: An Introduction to GAMS/MCP and GAMS/MOSGE, GAMS Corporation, GAMS/MPSGE guide.

Sen A. (1976) Poverty: An Ordinal Approach to Measurement, *Econometrica*, 44:2:219-231.

Shorrocks A. F. (1995) Revisiting the Sen Poverty Index, Econometrica, 63:5:1225-1230.

Slesnick D.T. (1996) Consumption and poverty: how effective are in-kind transfers, *The Economic Journal* Vol. 106, No. 438 Sep., pp. 1527-1545

Stifel, D.C. Thorbecke, E.(2003) A dual-dual CGE model of an archetype African economy: trade reform, migration and poverty. Journal of Policy Modeling, Apr, Vol. 25 Issue 3, p207, 29p;

Tuerck, Haughton, Bhattarai, Ngo and S-Penalvar (2006) The Economic Effects of the Fair Tax: Results from The Beacon Hill Institute CGE Model, Beacon Hill Institute at Suffolk University, Boston, USA.

Townsend, P (1979) Poverty in the United Kingdom, Allen Lane and Penguin, London.
UNDP (1991), Human Development Report.

Vaughan, R. N (1987) "Welfare approaches to the measurement of poverty", The Economic Journal v97 supp p160-70.

World Bank (1990) "Poverty: The World development Report 1990", OUP, Washington D.C.
The World Bank, Nepal: Poverty and Incomes, Washington D. C., 1991.

Appendix 1
Reality of poverty and income redistribution

Information about the depth of poverty is obtained from the living standard surveys conducted by statistical offices. Though these surveys constitute a wide range of questions regarding the quality of human life measured by level of education and health access to modern means of communication and transportation and many other environmental factors the distribution of consumption and income are often considered the most important factors to study the issue of poverty and income distribution often expressed by deciles of households as contained in Table A1 for a number of economies.

Table A1
Income of households in local currency units

	Bolivia	Chile	Ghana	Nepal	South Korea	Switzerland	Taiwan	Tunisia	UK	USA
h1	23	3,183	55,701	3,190	783,280	5,619	30,171	134	710	1,478
h2	38	5,352	83,186	4,820	1,276,662	10,070	41,341	181	1,590	3,235
h3	49	7,015	105,938	6,061	1,574,922	11,992	48,632	226	2,019	4,586
h4	61	8,685	128,276	7,394	1,850,881	14,043	55,736	277	2,361	5,782
h5	75	10,609	149,574	8,846	2,118,479	16,338	63,157	331	2,744	6,976
h6	91	13,037	172,952	10,545	2,416,738	18,883	71,287	399	3,168	8,333
h7	110	16,221	201,659	13,098	2,790,259	22,386	81,423	482	3,637	10,014
h8	144	21,199	242,501	16,734	3,289,217	27,059	94,182	624	4,277	12,046
h9	203	32,201	303,300	23,845	4,047,409	33,638	115,828	891	5,204	15,299
h10	474	112,568	539,155	57,145	7,698,998	64,669	194,204	1,165	8,455	24,266

Source: http://www.worldbank.org/research/inequality/data.htm; CBS for Nepal.

Absolute distribution like above can be used to derive absolute poverty measures based on certain criteria, such as the mean of income, half of the mean of income or a dollar a day as shown in Table A2.

Table A2
Mean income and poverty line and population below it across economies

	Bolivia*	Chile	Ghana	Nepal	South Korea	Switzerland	Taiwan	Tunisia	UK	USA
Mean income	127	23007	198224	15168	2784685	22470	79596	471	3417	920
Income in US dollars	27	57	305	312	3469	15182	3016	471	5099	920
Poverty line -hmi	63	11504	99112	7584	1392342	11235	39798	236	1708	460
Income gap - hmi	-83	-22674	-59337	-8871	-724743	-6781	-9627	-166	-1117	-450
Income gap ratio_hmi	0.163	0.197	0.150	0.146	0.130	0.151	0.121	0.117	0.163	0.16
Percent below PL	40	50	20	40	20	20	10	30	20	3
Income gap -mi	-441	-96947	-493718	-52221	-6687145	-57957	-167253	-1278	-7907	-2481
Income gap ratio_mi	0.496	0.527	0.415	0.492	0.400	0.368	0.350	0.452	0.386	0.45
Percent below PL	70	80	60	70	60	70	60	60	60	6
Total income	1268	230070	1982242	151678	27846845	224697	795961	4710	34165	9201
Population (million)	8.06	13.77	16.45	19.27	44.06	6.94	20.9	8.57	58.19	258.1
Exchange rate (for $)	4.7	404.35	649.06	48.61	802.67	1.48	26.39	1	0.67	

Authors own calculations. Symbol * indicates monthly series.

Absolute poverty measures do not violate the monotonicity axiom of distribution. As Sen (1976) and Foster and Shorrocks (1988) argued it is important to incorporate the degree of inequality in the measurement of poverty. This requires computing the Gini coefficient as contained in Table A4 and Table A5 along with head count and income gap ratios contained Table A2 and Table A3. Comparing the pattern of shares of income going to different households across countries gives a rough idea about the relative position of a particular household in the income distribution. EU economies such as the UK and Switzerland as well as the African economies such as the Ghana and Tunisia have more equal distribution of income than the US. East Asian economies such as South Korea and Taiwan seem to be with more equal income

distribution than the South Asian economies such as Nepal. Latin American economies, Chile and Bolivia have highly unequal distribution of income.

Table A3

Structure of income distribution across countries

	Bolivia	Chile	Ghana	Nepal	South Korea	Switzerland	Taiwan	Tunisia	UK	USA
H1	0.018	0.014	0.028	0.021	0.028	0.025	0.038	0.028	0.021	0.016
H2	0.030	0.023	0.042	0.032	0.046	0.045	0.052	0.038	0.047	0.035
H3	0.039	0.030	0.053	0.040	0.057	0.053	0.061	0.048	0.059	0.050
H4	0.048	0.038	0.065	0.049	0.066	0.062	0.070	0.059	0.069	0.063
H5	0.059	0.046	0.075	0.058	0.076	0.073	0.079	0.070	0.080	0.076
H6	0.072	0.057	0.087	0.070	0.087	0.084	0.090	0.085	0.093	0.091
H7	0.087	0.071	0.102	0.086	0.100	0.100	0.102	0.102	0.106	0.109
H8	0.114	0.092	0.122	0.110	0.118	0.120	0.118	0.132	0.125	0.131
H9	0.160	0.140	0.153	0.157	0.145	0.150	0.146	0.189	0.152	0.166
H10	0.374	0.489	0.272	0.377	0.276	0.288	0.244	0.247	0.247	0.264
	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000

It is possible to measure a comprehensive poverty index as in equation (1) using the data on income distribution contained in Tables A1-A3. These comprehensive poverty indices are given in Table A4. Theoretically value of such index varies between zero and one but it is between these two extremes in reality. Economies that score low in terms of absolute income can score high in terms relative distribution.

Table A4

Cumulative share of income distribution across countries

	Bolivia	Chile	Ghana	Nepal	South Korea	Switzerland	Taiwan	Tunisia	UK	USA
H1	0.018	0.014	0.028	0.021	0.028	0.025	0.038	0.028	0.021	0.016
H2	0.048	0.037	0.070	0.053	0.074	0.070	0.090	0.067	0.067	0.051
H3	0.087	0.068	0.124	0.093	0.131	0.123	0.151	0.115	0.126	0.101
H4	0.135	0.105	0.188	0.142	0.197	0.186	0.221	0.174	0.196	0.164
H5	0.194	0.151	0.264	0.200	0.273	0.258	0.300	0.244	0.276	0.240
H6	0.266	0.208	0.351	0.269	0.360	0.342	0.390	0.329	0.369	0.330
H7	0.353	0.279	0.453	0.356	0.460	0.442	0.492	0.431	0.475	0.439
H8	0.466	0.371	0.575	0.466	0.578	0.562	0.610	0.563	0.600	0.570
H9	0.626	0.511	0.728	0.623	0.724	0.712	0.756	0.753	0.753	0.736
H10	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000

Table A5

Sen's Poverty indices in cross section of countries

	Income Gap Ratio_mi	Income Gap Ratio_hmi	Gini coefficient	Poverty index -mi	Poverty index-hmi
Bolivia	0.102326	0.079653	0.624132	0.631896	0.60628
Chile	0.123093	0.090413	0.702367	0.702076	0.675029
Ghana	0.119833	0.10950	0.516766	0.538724	0.50398
Nepal	0.098711	0.072422	0.61786	0.625968	0.602082
South Korea	0.119786	0.109359	0.507487	0.530548	0.495733
Switzerland	0.124988	0.124965	0.526959	0.548587	0.511093
Taiwan	0.103491	0.120949	0.465898	0.490125	0.457928
Tunisia	0.11925	0.071833	0.534544	0.554274	0.524879
UK	0.132031	0.146092	0.498815	0.525377	0.484379
USA	0.139896	0.113125	0.544104	0.565913	0.527802

Appendix 2

TABLE 14 (Appendix 1): Average incomes, taxes and benefits by decile groups of ALL households, 2003-04

	Decile groups of all households ranked by equivalised disposable income										All house-holds
	Bottom	2nd	3rd	4th	5th	6th	7th	8th	9th	Top	
Average per household (£ per year)											
Decile points (equiva		9348	11667	13712	15956	18444	21206	24486	29555	38420	
Number o	2464	2469	2465	2468	2465	2469	2468	2466	2467	2468	24670
Original income											
Wages an	1340	3110	5382	9368	13884	18617	22556	29741	36014	58843	19885
Imputed i	8 -		26	30	97	144	278	432	716	1573	330
Self-empl	439	578	695	1268	1018	1346	2232	2522	4326	12745	2717
Occupatic	401	890	1250	1871	2216	2623	2520	3021	2962	3515	2127
Investmer	256	233	240	381	480	563	612	917	1452	3572	871
Other inc	141	99	113	187	219	221	269	161	226	360	200
Total	2586	4910	7706	13105	17915	23514	28467	36794	45695	80608	26130
Direct benefits in cash											
Contributory											
Retiremen	1807	2754	2838	2422	2322	1758	1537	1174	925	553	1809
Job seeker	58	40	11	14	15	6	4	3	5	4	16
Incapacity	337	554	375	284	179	209	163	162	36	25	232
Widows' b	32	28	36	56	52	54	22	28	19	3	33
Statutory	1	3	1	1	2	7	17	15	13	44	10
Non-contributory											
Income su	914	1075	728	471	345	190	174	25	39	6	397
Child ben	404	397	363	452	425	402	367	354	276	229	367
Housing b	714	875	920	592	474	246	223	64	74	13	420
Job seeker	173	86	46	8	31	2	15	0 -	-		36
Invalid car	34	43	116	74	36	51	18	22	13	3	41
Attendanc	8	46	90	71	73	85	63	11	21 -		47
Disability	149	253	422	437	398	331	295	157	85	42	257
War pensi	2	18	6	23	28	34	34	41	43 -		23
Severe dis	50	34	43	60	37	63	13	1	14	4	32
Industrial	5	28	23	33	34	38	15	26	15	3	22
Student su	14	30	15	58	36	40	18	16	35	103	37
Governme	15	8	10	9	12	5	3	3	12 -		8
Tax credit	170	319	366	390	278	185	90	68	60	15	194
Other non	181	173	189	137	139	101	75	72	55	44	117
Total cash	5067	6763	6598	5591	4915	3805	3147	2242	1740	1091	4096
Gross inc	7654	11673	14304	18697	22829	27319	31614	39037	47436	81700	30226
Direct taxes and Employees' NIC											
Income ta	287	455	854	1548	2258	3170	4190	5675	7478	16287	4220
less : Tax	16	96	170	271	232	211	186	167	65	21	144
Employe	92	183	330	610	925	1301	1622	2161	2616	3326	1317
Council ta	730	766	746	814	828	862	899	952	1027	1142	876
less : Cou	278	265	214	139	93	55	48	13	10	7	112
Total	815	1043	1545	2563	3686	5066	6477	8609	11046	20726	6158
Disposabl	6839	10630	12759	16134	19144	22253	25137	30428	36390	60973	24069
Equivalise	6706	10527	12698	14818	17243	19874	22824	26827	33303	60042	22486
Indirect taxes											
Taxes on final goods and services											
VAT	968	1098	1133	1538	1685	1989	2110	2381	2758	3563	1922
Duty on to	287	339	347	263	325	316	366	266	300	210	302
Duty on b	54	83	79	100	118	127	142	175	172	143	119
Duty on w	76	79	104	121	141	184	140	186	252	250	153
Duty on h	212	225	255	366	417	495	525	617	655	730	450
Vehicle ex	65	67	76	107	125	140	148	179	186	195	129
Television	86	79	85	90	93	98	104	110	109	110	96
Stamp dut	44	30	38	68	66	86	107	131	188	395	115
Customs d	16	17	18	22	23	27	28	31	36	44	26
Betting tax	20	23	27	32	52	40	61	35	36	25	35
Insurance	23	23	26	33	38	46	52	60	65	85	45
Air passen	11	21	6	10	15	15	25	29	37	53	22
Camelot N	33	45	48	48	64	56	59	65	62	35	52
Other	8	13	7	21	29	12	31	25	23	19	19
Intermediate taxes											
Commerc	153	161	166	205	222	254	265	296	339	419	248
Employer	255	268	277	341	371	424	442	493	566	699	414
Duty on h	103	108	112	138	150	171	179	199	229	283	167
Vehicle ex	21	22	23	29	31	35	37	41	47	58	35
Other	137	144	149	184	200	229	238	266	305	377	223
Total indir	2572	2847	2976	3716	4166	4746	5058	5587	6367	7692	4573
Post-tax ir	4267	7783	9783	12418	14978	17506	20079	24841	30023	53281	19496
Benefits in kind											
Educatior	2612	1908	1566	2113	1995	1775	1605	1477	1254	822	1713
National l	3037	3430	3351	3160	3120	2874	2697	2520	2234	2074	2850
Housing s	80	89	83	67	49	38	27	15	5	0	45
Rail trave	25	13	15	24	23	39	43	56	78	106	42
Bus travel	57	61	55	62	53	58	46	50	53	41	54
School m	80	60	39	28	14	9	9	4	4	1	25
Total	5890	5559	5109	5455	5254	4794	4428	4122	3628	3044	4728
Final inco	10157	13342	14892	17873	20232	22300	24507	28963	33651	56326	24224

1 Including pension credit
2 Child tax credit and working tax credit payments which are treated as benefits (see Appendix 2, paragraph 22).
3 Child tax credit and working tax credit payments which are treated as negative income tax. Also includes tax relief at source on
4 Council tax and Northern Ireland rates after deducting discounts.

Source: Department of Work and Pension

Appendix 3

Social Accounting Matrix for the US, FY2004										
	AGRICF	MINING	CONSTR	FOODPR	APPARL	MFRCON	PPAPER	CHEMIC	COMPUT	MVOTRA
AGRICF	60.324699	0.075523	8.756138	108.759570	3.609051	11.736337	2.769786	2.654889	0.199718	0.205384
MINING	0.630624	46.117836	9.410011	0.697118	0.316800	4.806534	1.089859	111.711609	0.239660	0.770593
CONSTR	3.943935	1.359823	1.413288	3.305470	1.157377	1.682362	3.237946	6.858889	4.053642	3.321645
FOODPR	14.839546	0.009431	0.083866	59.072753	0.418635	0.108264	0.643794	1.856167	0.013513	0.038566
APPARL	0.661231	0.053663	2.207962	0.175126	26.225295	2.269964	0.546674	2.066968	0.036781	3.786762
MFRCON	0.825566	0.897983	120.476241	3.676016	0.454546	35.927648	2.850139	3.269755	1.989527	11.534019
PPAPER	1.887524	0.229357	9.509516	25.435357	0.938564	4.071708	66.855360	12.489237	2.345807	1.677260
CHEMIC	17.579777	6.394411	55.181393	21.444736	14.345982	12.926392	22.259706	178.425392	9.297208	20.549782
COMPUT	0.062587	0.057475	7.503342	0.137641	0.045642	0.094758	0.206731	1.760313	81.196678	18.671173
MVOTRA	1.036976	0.309656	6.673051	0.472078	0.061155	0.677529	0.151494	0.259722	1.043502	103.898152
METALS	0.801142	3.002075	88.731697	9.838769	0.110428	9.738409	1.428925	6.101842	17.377242	42.831314
MACHIN	2.474855	3.133257	25.325236	1.123680	1.133250	1.426394	1.747022	3.639763	2.662188	17.491824
ELECTR	0.509073	0.283741	22.171529	0.171994	0.012173	0.461875	0.061213	0.414675	3.084334	2.214885
MFROTH	0.094765	0.048610	2.926119	0.234407	0.379600	0.269272	0.252005	0.335241	0.232405	0.200955
TRANSP	7.918690	4.867052	47.558423	19.119218	4.149449	15.986322	14.972081	37.340605	4.408546	12.330998
INFORM	2.118109	1.441133	22.993301	6.211329	1.825461	2.540283	3.293416	7.848375	5.620148	3.511245
UTILIT	3.034447	6.874746	3.700592	5.972126	2.360699	5.182668	6.207744	29.106072	2.316061	4.084709
WHOLSA	18.634738	4.460301	85.519813	46.046386	11.798908	22.913568	19.614538	48.918918	29.618289	38.879190
RETAIL	0.141223	0.705208	71.131788	2.743384	0.514178	1.040946	0.925067	2.076161	0.966126	1.244471
BANKNG	3.472798	3.641208	20.415029	9.841804	2.652883	4.424447	4.600464	13.705175	6.982829	8.444376
INSURS	0.738406	0.200682	4.873547	0.737783	0.176729	0.337844	0.323640	0.685992	0.339523	0.461507
REALST	16.053667	22.792680	27.628475	5.253017	2.109451	3.205222	4.441992	7.400956	5.225974	3.832074
ADMSVC	0.309618	1.221824	14.168745	4.727532	1.342193	2.767967	2.665137	5.371413	3.966019	4.093073
BSVCES	3.235732	5.925572	115.744796	39.509126	10.830119	8.944569	8.978492	40.553439	22.757650	18.418436
ENTRHO	0.594345	1.231565	2.757046	3.903024	1.149265	1.734549	1.955980	3.992617	2.406769	3.135392
HEALTH	3.723260	1.502613	1.551037	0.540318	2.471158	5.145216	1.145194	9.541835	5.316004	3.109575
OTHSVC	2.334429	0.308539	9.173822	3.434009	1.169797	2.013995	2.685443	5.770122	1.933417	10.052018
FLABOR	45.269986	41.760768	428.913940	86.773415	45.625324	86.984479	81.610874	165.343665	188.131827	159.008309
FKAPIT	32.535993	27.869234	58.626495	20.410722	5.532724	11.208775	10.035696	37.308070	6.361405	7.682785
LESS10										
LESS25										
LESS50										
LESS75										
LES100										
LES150										
MOR150										
INVEST										
USPITX										
USPITK	0.528907	2.123789	4.563631	8.417819	0.680837	1.747162	1.730411	19.168149	2.055547	3.790056
USCITX	0.584016	2.345072	5.039127	9.294891	0.751775	1.929203	1.910706	21.165324	2.269720	4.184951
USSSTX	2.325357	2.475589	21.182248	5.104528	1.898257	4.395281	4.093481	8.582387	7.799869	9.981799
USEXTX	0	0.560892	0	14.246002	0	0	0	34.013143	0	0.922367
USEGTX										
USDUTY	0.072716	0.076154	0	0.688387	11.059994	0.689064	0.044316	1.619970	0.874016	2.729163
USFEES	0.386642	0.442391	1.701516	0.588202	0.158428	0.353536	0.328072	0.976711	0.501113	0.643072
USFAIR										
STPITX										
STSATX	0.951338	1.704416	2.543384	6.869164	0.328474	0.769920	0.820055	2.545314	1.269801	1.117963
STCITX	0.094976	0.381369	0.819491	1.511588	0.122258	0.313738	0.310730	3.442025	0.369115	0.680580
STOTTX	0.386882	6.971217	1.231464	6.877376	0.151077	0.340862	0.350327	1.437209	0.612177	0.685869
STFEES	3.430363	3.924979	15.096192	5.218649	1.405609	3.136647	2.910720	8.665576	4.445977	5.705466
LOPRTX										
LOPBTX	5.599942	9.871070	3.088164	2.831531	0.899312	1.663288	2.129044	6.049602	3.484122	2.957452
LOSATX	0.220705	0.395415	0.590050	1.593606	0.076204	0.178617	0.190248	0.590498	0.294586	0.259361
LOOTTX	0.268682	0.356697	1.158752	1.049521	0.115738	0.263571	0.250440	0.989845	0.373109	0.479264
LOFEES	3.921585	4.487029	17.257940	5.965951	1.606890	3.585809	3.327530	9.906471	5.082633	6.522479
USNOND										
USSSSP										
USCARE										
USCAID										
USINCS										
USRETR										
USDEFF										
USOTHS										
SLEDUC										
SLNOED										
SLINVE										
ROWSCT	44.088563	59.036732	52.800758	20.559221	9.519642	124.716066	21.729632	61.443098	130.733277	76.746066

I appreciate Professor Jonathan Haughton for providing this social accounting matrix of the US economy.

LES150	MOR150	INVEST	USPITX	USPITK	USCITX	USSSTX	USEXTX	USEGTX	USDUTY	USFEES	USFAIR
4.929981	3.582746	0									
0.392934	0.285555	29.677560									
1.000000	1.000000	876.477411									
43.288178	31.458657	0									
14.224529	10.337338	2.668473									
5.871072	4.266661	145.922080									
3.813916	2.771672	0									
21.413638	15.561853	2.961330									
3.045444	2.213204	189.326471									
19.361932	14.070831	138.168515									
1.430324	1.039454	7.359293									
0.811185	0.589509	146.325982									
2.931829	2.130637	14.900996									
5.533986	4.021692	40.553043									
25.845465	18.782583	9.938865									
29.103743	21.150449	47.699386									
20.173073	14.660305	0									
33.352588	24.238201	73.867487									
150.490520	109.365379	27.271318									
45.114691	32.786027	0									
44.885199	32.619260	0									
141.944663	103.154904	1.456583									
1.873846	1.361772	0									
15.741390	11.439685	111.025207									
32.539439	23.647259	0									
141.008385	102.474510	0									
68.841982	50.029275	0									
212.275367	288.703084										
72.692047	323.155577										
3.807852	6.346420										
24.840012	96.388272										
8.938194	9.539422										
20.647256	16.301593										
2.529760	9.001935										
		21.040795	637.471920	171.528080	189.400000	733.400000	69.900000	24.800000	21.100000	32.600000	
		351.459205									
43.900999	31.904006	-653.400000									

STPITX	STSATX	STCITX	STOTTX	STFEES	LOPRTX	LOPBTX	LOSATX	LOOTTX	LOFEES	USNOND	USSSSP
										243.110378	
										10.839905	
											75.073907
											122.199094
											123.199535
											61.795391
											22.007306
											6.859976
											1.609765
										-219.417824	
										412.744975	
										249.746400	
										147.966764	
										160.143371	
										113.368406	
										454.100000	
										296.605341	
197.421360	198.431303	30.801302	166.834888	289.233780	123.534862	184.0917579	46.034917	61.514512	330.651553		
										32.033080	
197.42	198.43	30.80	166.83	289.23	123.53	184.09	46.03	61.51	330.65	1901.24	412.74
197.42	198.43	30.80	166.83	289.23	123.53	184.09	46.03	61.51	330.65	1901.24	412.74

USCARE	USCAID	USINCS	USRETR	USDEFF	USOTHS	SLEDUC	SLNOED	SLINVE	ROWSCT		Total
				0.038162	0.083756	0.809996	5.078629	0.000469	33.840195		308.6484
				0.148724	0.111426	0.161391	0.893318	0.003242	9.022215		281.9288
				10.842157	21.819755	8.754396	57.393781	238.523949	0		1402.1990
				0.412100	1.352138	4.763216	9.892173	0.000672	46.625912		580.5843
				0.657048	0.105207	0.132362	2.224077	0.003663	26.620046		171.6913
				0.587733	1.183910	0.255622	1.018679	0.500786	18.434900		404.7111
				1.514923	0.951660	4.258157	8.448791	0.002762	25.092776		307.6821
				8.622810	0.805611	7.993574	33.513068	0.167320	150.253338		927.4032
				3.195580	12.503149	0.223971	0.979358	0.437849	179.400238		570.2878
				4.417501	32.246595	0.634165	1.617995	1.007580	158.636526		622.8864
				4.242691	4.493235	0.345796	2.001663	0.109203	53.276079		430.5206
				0.658481	2.582415	0.877072	1.098040	0.658819	71.855533		349.5589
				0.488986	1.007240	0.366751	0.596943	0.153069	27.088156		114.5597
				0.324723	1.132139	0.607354	3.918516	0.159530	26.192433		138.2461
				8.517658	1.120338	7.543374	15.971101	0.094695	120.226702		741.7616
				6.003058	3.636207	9.211232	15.142753	0.000356	21.616413		748.0519
				3.796071	0.656976	9.607484	24.582982	0	1.525913		398.9213
				2.692846	5.402535	3.953898	11.416804	0.713798	86.113377		980.7529
				0.801073	0.788363	0	8.141804	0	0.823691		1294.0696
				0.051572	1.268261	0.058188	25.947903	0	35.590306		975.7648
				0.029422	2.697539	0.479467	0.436436	0	3.605980		405.9768
				1.478979	3.472873	1.638458	25.335121	0.000004	41.646857		1616.9133
				0.926523	1.082600	1.259854	11.478228	0	2.235295		261.3751
				35.919464	17.304706	9.785979	35.442311	0.000013	20.814849		1473.5652
				1.959018	0.173104	0.268341	7.556077	0	2.822044		339.3892
				0.035159	1.753202	0.004304	6.603037	0	0.056831		1134.8361
				1.135069	9.088751	3.006426	9.766803	0	10.753871		563.2221
				117.598780		499.048059	427.159750				6952.0808
				5.398113			51.327315				1350.8936
45.005105	27.745011	29.951126	20.789829		10.058054		44.832387				321.5000
73.982979	42.584330	46.041553	32.334155		15.635079		68.789557				979.1407
74.624201	44.246367	47.912476	34.046552		16.454686		71.456256				2056.7929
37.543652	22.310544	24.196412	17.399167		8.404757		36.023624				1872.0426
13.410753	7.987306	8.675808	6.313660		3.048319		12.894879				1352.5579
4.192865	2.502819	2.722744	2.005458		0.967782		4.040281				1268.5954
0.986845	0.590387	0.643251	0.479585		0.231322		0.953038				1420.3797
				222.092607	-145.132414	-96.812206	449.192062				1584.7000
											637.4719
											189.4000
											733.4000
											69.9000
											24.8000
											21.1000
											32.6000
											0.0000
											197.4214
											198.4313
											30.8013
											166.8349
											289.2338
											123.5349
											184.0918
											46.0349
											61.5145
											330.6516
											1901.2408
											412.7450
											249.7464
											147.9668
											160.1434
											113.3684
											454.1000
											296.6053
							483.620085				483.6201
					258.114063						2238.1235
							244.063955				244.0640
				9.512967		4.383401	17.273921	1.526176			0.0000
											0.0000
249.75	147.97	160.14	113.37	454.10	296.61	483.62	2238.12	244.06	0.00	0.00	46743.14
249.75	147.97	160.14	113.37	454.10	296.61	483.62	2238.12	244.06	0.00	0.00	46914.67

Appendix 4

Change in the level of utility each year with elimination of capital income tax and imposition of uniform labour income tax

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
H1	0.0066	0.0024	0.0048	0.0071	0.009	0.0107	0.0121	0.0134	0.0144	0.0153	0.0161	0.0167	0.0172	0.0176	0.018	0.0183	0.0185	0.0187	0.0189	0.019	0.0192	0.0193	0.0194
H2	0.009	0.0048	0.0069	0.0088	0.0104	0.0119	0.0131	0.0142	0.0151	0.0159	0.0165	0.017	0.0175	0.0179	0.0182	0.0184	0.0187	0.0188	0.019	0.0191	0.0192	0.0193	0.0194
H3	0.0097	0.0055	0.0075	0.0092	0.0108	0.0122	0.0134	0.0144	0.0153	0.016	0.0166	0.0172	0.0176	0.0179	0.0182	0.0185	0.0187	0.0189	0.019	0.0191	0.0192	0.0193	0.0194
H4	0.0101	0.0058	0.0078	0.0095	0.011	0.0124	0.0135	0.0145	0.0154	0.0161	0.0167	0.0172	0.0176	0.018	0.0183	0.0185	0.0187	0.0189	0.019	0.0192	0.0193	0.0193	0.0194
H5	0.0101	0.0059	0.0078	0.0095	0.0111	0.0124	0.0136	0.0146	0.0154	0.0161	0.0167	0.0172	0.0176	0.018	0.0183	0.0185	0.0187	0.0189	0.019	0.0192	0.0193	0.0193	0.0194
H6	0.0101	0.0058	0.0078	0.0095	0.011	0.0124	0.0135	0.0145	0.0154	0.0161	0.0167	0.0172	0.0176	0.018	0.0183	0.0185	0.0187	0.0189	0.019	0.0192	0.0193	0.0193	0.0194
H7	0.01	0.0057	0.0077	0.0094	0.011	0.0123	0.0135	0.0145	0.0154	0.0161	0.0167	0.0172	0.0176	0.018	0.0183	0.0185	0.0187	0.0189	0.019	0.0191	0.0193	0.0193	0.0194
H8	0.0102	0.006	0.0079	0.0096	0.0111	0.0124	0.0136	0.0146	0.0154	0.0161	0.0167	0.0172	0.0176	0.018	0.0183	0.0185	0.0187	0.0189	0.019	0.0192	0.0193	0.0193	0.0194
H9	0.0101	0.0059	0.0078	0.0095	0.011	0.0124	0.0136	0.0145	0.0154	0.0161	0.0167	0.0172	0.0176	0.018	0.0183	0.0185	0.0187	0.0189	0.019	0.0192	0.0193	0.0193	0.0194
H10	0.0081	0.0039	0.0061	0.0081	0.0099	0.0114	0.0127	0.0139	0.0148	0.0157	0.0163	0.0169	0.0174	0.0178	0.0181	0.0184	0.0186	0.0188	0.019	0.0191	0.0192	0.0193	0.0194

Level of relative to the base year in response to elimination of capital income tax and a uniform labour income tax rate of 40 percent

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
H1	-0.3354	-0.3179	-0.2951	-0.2759	-0.2598	-0.2463	-0.2351	-0.2258	-0.218	-0.2116	-0.2064	-0.202	-0.1984	-0.1955	-0.1931	-0.1911	-0.1895	-0.1881	-0.1862	-0.1855	-0.185	-0.1845	-0.1842	-0.184	-0.1839
H2	-0.3818	-0.3671	-0.3467	-0.3295	-0.3149	-0.3027	-0.2925	-0.284	-0.277	-0.2711	-0.2663	-0.2623	-0.259	-0.2563	-0.2541	-0.2523	-0.2508	-0.2496	-0.2478	-0.2472	-0.2467	-0.2463	-0.2461	-0.2459	-0.2458
H3	-0.3169	-0.3038	-0.2852	-0.2695	-0.2562	-0.245	-0.2357	-0.2279	-0.2214	-0.2161	-0.2116	-0.208	-0.205	-0.2025	-0.2005	-0.1988	-0.1974	-0.1963	-0.1947	-0.1941	-0.1937	-0.1933	-0.1931	-0.193	-0.1929
H4	-0.3022	-0.2897	-0.2718	-0.2566	-0.2438	-0.233	-0.224	-0.2165	-0.2103	-0.2051	-0.2008	-0.1972	-0.1943	-0.1919	-0.19	-0.1883	-0.187	-0.1859	-0.1844	-0.1838	-0.1834	-0.1831	-0.1829	-0.1827	-0.1827
H5	-0.2702	-0.258	-0.2406	-0.2258	-0.2133	-0.2028	-0.194	-0.1867	-0.1806	-0.1756	-0.1714	-0.1679	-0.1651	-0.1627	-0.1608	-0.1593	-0.158	-0.1569	-0.1554	-0.1549	-0.1544	-0.1541	-0.1539	-0.1538	-0.1537
H6	-0.2396	-0.2276	-0.2106	-0.1962	-0.1839	-0.1737	-0.1651	-0.1579	-0.152	-0.147	-0.1429	-0.1396	-0.1368	-0.1345	-0.1326	-0.1311	-0.1298	-0.1288	-0.1273	-0.1268	-0.1264	-0.1261	-0.1259	-0.1257	-0.1257
H7	-0.2119	-0.2001	-0.1834	-0.1692	-0.1571	-0.147	-0.1386	-0.1316	-0.1257	-0.1208	-0.1168	-0.1135	-0.1108	-0.1085	-0.1067	-0.1052	-0.1039	-0.1029	-0.1015	-0.1009	-0.1005	-0.1002	-0.1	-0.0999	-0.0999
H8	-0.2404	-0.2286	-0.2117	-0.1974	-0.1853	-0.1751	-0.1666	-0.1595	-0.1536	-0.1487	-0.1446	-0.1413	-0.1385	-0.1363	-0.1344	-0.1329	-0.1316	-0.1306	-0.1291	-0.1286	-0.1282	-0.1279	-0.1277	-0.1276	-0.1275
H9	-0.2114	-0.1998	-0.1832	-0.1691	-0.1571	-0.1471	-0.1387	-0.1317	-0.1259	-0.1211	-0.1171	-0.1138	-0.1111	-0.1089	-0.1071	-0.1056	-0.1043	-0.1033	-0.1019	-0.1014	-0.101	-0.1007	-0.1005	-0.1003	-0.1003
H10	0.1171	0.1274	0.1412	0.1528	0.1627	0.1709	0.1777	0.1835	0.1882	0.1921	0.1954	0.1981	0.2003	0.2021	0.2036	0.2048	0.2058	0.2066	0.2078	0.2082	0.2085	0.2088	0.209	0.2091	0.2091

Appendix 5

Input/Output Table for 1999/00 at Producer's Price in million Rupees.

S/N	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	C	G	IP	IG	S	X	Stotal	Total
1	1,300.71	0.00	0.00	444.28	0.00	0.00	11,510.19	0.15	15.96	0.37	1.02	12.57	0.06	3.45	1.51	11.93	20.71	0.06	10.29	0.00	0.00	193.57	0.00	0.00	0.31	13,527.16	61,257.01	0.00	0.00	0.00	1,191.86	5.39	62,454.26	75,981.42
2	0.00	580.33	0.00	0.00	0.00	0.00	2,471.21	69.04	274.39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.08	0.00	0.00	3,395.05	6,412.04	0.00	0.00	0.00	2,875.88	1,158.59	10,446.51	13,841.56
3	0.00	0.00	687.29	0.00	0.00	0.00	11.26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	11.88	16.27	726.70	13,214.18	0.00	0.00	0.00	13,053.60	92.71	26,360.49	27,087.19
4	4,674.78	315.25	479.12	71.69	0.00	0.00	728.28	0.00	689.50	321.57	0.00	0.00	0.00	0.00	0.00	1.30	0.00	0.00	8.50	0.00	0.00	0.00	0.00	0.00	0.03	7,290.02	14,525.98	0.00	538.38	0.00	27,214.02	169.98	42,448.36	49,738.38
5	0.00	0.00	0.00	93.88	31.56	0.00	36.73	0.25	2.26	0.14	637.56	0.38	0.50	537.80	57.39	110.71	1.41	0.01	685.08	410.68	0.00	0.00	0.00	6.93	0.00	2,613.26	8,480.14	0.00	0.00	0.00	-1,317.26	463.04	7,625.93	10,239.19
6	0.00	0.00	0.00	0.00	0.00	15.21	4.04	0.17	0.01	0.56	0.01	0.46	0.00	3.24	0.07	449.35	5.58	0.02	3.90	0.00	0.00	0.00	0.00	0.00	0.00	482.62	0.00	0.00	0.00	0.00	1,470.68	52.95	1,523.63	2,006.25
7	0.00	0.00	0.00	1,979.06	0.00	0.00	1,454.58	0.00	0.00	0.00	0.00	0.00	0.00	35.27	0.00	0.00	0.00	0.00	3.16	0.00	0.73	81.33	8.86	0.00	1,457.56	5,020.56	58,954.02	0.00	0.00	0.00	-24,785.52	4,368.69	38,537.19	43,557.75
8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	445.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	445.05	3,886.06	0.00	0.00	0.00	2,405.29	32.18	6,323.53	6,768.58
9	0.00	0.00	0.00	0.00	2.00	0.00	1.80	0.00	4,168.53	2.76	0.00	3.46	0.00	0.00	0.53	1.48	0.00	0.00	1.79	0.00	2.02	13.16	23.27	48.79	601.64	4,871.23	6,540.99	0.00	0.00	0.00	-8,314.47	25,916.97	24,143.49	29,014.72
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.34	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.34	450.02	0.00	0.00	0.00	583.80	271.49	1,305.31	1,310.65
11	0.00	0.00	0.00	0.00	0.00	0.00	0.84	0.00	0.00	0.00	17.55	0.00	0.00	0.00	0.00	1.62	1.45	0.00	284.71	719.75	0.11	0.03	0.36	0.00	4.57	1,031.00	807.69	0.00	53.43	13.87	-0.75	10.65	884.89	1,915.89
12	0.00	0.00	0.00	0.00	1.87	1.46	0.00	0.00	0.64	0.00	0.04	423.94	0.00	0.00	7.89	0.00	20.14	0.00	21.90	5.15	6.94	116.84	14.29	121.70	56.44	799.23	1,399.36	0.00	0.00	0.00	1,107.03	152.83	2,659.22	3,458.45
13	0.00	0.00	0.00	0.00	0.00	0.68	14.48	0.25	2.94	0.08	0.36	0.20	7.55	0.49	0.87	1.04	1.02	0.13	0.51	383.91	0.09	0.03	0.10	1.06	7.23	423.00	0.00	0.00	0.00	0.00	-0.08	0.00	-0.08	422.92
14	2,600.64	479.43	418.26	232.10	0.00	0.00	0.31	0.00	0.00	0.00	0.02	21.94	0.00	684.27	0.00	0.00	0.01	0.00	0.00	419.03	15.38	27.04	16.53	0.00	83.98	4,998.92	3,232.07	0.00	0.00	0.00	-4,586.43	3,696.72	2,342.36	7,341.28
15	0.00	0.00	0.00	0.00	0.00	0.00	4.20	0.00	0.00	83.47	0.00	0.00	0.00	0.00	488.52	1.27	32.57	43.20	10.85	4.31	0.00	0.00	1.16	0.00	0.01	669.57	904.49	0.00	0.00	0.00	938.96	1,589.82	3,433.27	4,102.84
16	0.00	0.00	0.00	0.00	2.02	6.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	24.99	0.00	157.91	1.79	0.07	0.51	5,079.26	1.60	0.64	3.70	0.00	79.51	5,358.09	1,547.93	0.00	0.00	0.00	-1,284.45	290.13	553.61	5,911.70
17	443.97	240.47	25.61	86.43	1.38	0.00	0.00	0.00	0.00	0.00	0.03	0.07	0.00	0.00	0.00	32.88	2,015.62	666.12	144.34	4,354.11	8.08	26.10	11.40	383.68	337.71	8,777.99	1,732.15	0.00	57.54	37.26	1,925.80	3,487.95	7,240.70	16,018.69
18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	302.88	18.57	0.32	15.11	53.84	144.75	535.46	23.66	0.00	0.00	0.00	2,634.89	33.50	2,692.05	3,227.51
19	18.79	4.11	71.24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.08	32.20	0.00	0.00	53.46	187.88	6,203.93	0.00	0.00	0.00	-6,294.72	4,413.03	4,322.23	4,510.11
20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	37,699.17	25,441.46	5,821.03	0.00	68,961.66	68,961.66
21	0.00	0.00	0.00	8.07	1.91	0.38	348.13	9.12	164.91	20.35	16.00	51.95	1.65	34.08	34.59	136.22	76.74	13.19	45.67	9.71	118.76	310.29	62.38	80.46	112.76	1,657.32	1,684.16	0.00	0.00	0.00	4,823.23	0.00	6,507.39	8,164.71
22	1,842.81	331.95	403.54	572.07	22.84	21.78	2,741.16	98.02	941.11	74.35	124.38	98.61	27.12	244.25	104.98	165.16	358.81	119.66	404.89	2,181.85	84.19	4,507.71	6,841.75	746.78	1,797.64	24,857.42	20,952.98	0.00	484.95	146.78	10,552.47	14,347.44	46,484.62	71,342.04
23	2,764.21	497.92	605.31	858.10	46.87	32.87	4,381.38	219.46	1,468.88	114.96	193.06	159.74	44.70	407.55	174.43	274.27	552.23	196.68	620.75	2,747.87	103.78	4,284.69	4,506.09	666.80	2,501.47	28,424.08	15,808.88	0.00	784.96	237.51	9,603.27	6,924.96	33,359.59	61,783.67
24	4,675.06	846.56	1,338.62	1,352.17	23.89	58.43	2,832.21	118.05	984.50	73.92	133.18	109.02	28.17	253.87	107.87	199.56	368.53	120.78	419.67	1,846.19	1,143.23	2,902.18	6,340.71	1,383.35	1,009.80	28,669.54	9,576.25	0.00	0.00	0.00	3,043.02	0.00	12,619.27	41,288.80
25	107.11	23.47	6.44	4.67	2.04	20.74	178.82	4.36	140.00	2.80	13.45	27.28	1.09	21.44	13.92	18.51	13.22	7.27	23.68	4,127.68	19.99	404.44	146.25	449.71	1,429.33	7,207.70	7,007.13	34,579.00	0.00	0.00	-14,416.39	21,441.02	48,610.76	55,818.46
dind	18,428.07	3,319.49	4,035.41	5,702.51	136.37	157.65	26,719.61	963.93	8,853.62	700.67	1,136.66	909.61	110.85	2,250.70	992.57	1,563.22	3,469.83	1,167.19	2,690.19	22,592.38	1,531.57	12,900.59	17,992.05	3,954.98	9,694.48	151,974.19	244,601.13	34,579.00	39,618.43	25,876.89	28,244.76	88,920.03	461,840.24	613,814.43
imp	1,574.10	188.95	288.40	0.00	96.03	0.00	3,530.09	1,470.18	8,596.09	14.62	42.61	1,254.04	75.06	2,190.90	1,662.90	943.81	5,776.17	1,129.02	336.59	9,825.76	677.08	14,673.06	14,050.97	408.48	11,881.46	80,686.38	36,282.38	0.00	4,179.00	468.00	0.00	0.00	40,929.38	121,615.76
tind	20,002.17	3,508.45	4,323.81	5,702.51	232.40	157.65	30,249.70	2,434.10	17,449.70	715.29	1,179.27	2,163.66	185.91	4,441.60	2,655.47	2,507.03	9,246.00	2,296.21	3,026.78	32,418.14	2,208.65	27,573.64	32,043.03	4,363.46	21,575.94	232,660.57	280,883.52	34,579.00	43,797.43	26,344.89	28,244.76	88,920.03	502,769.62	735,430.19
wage	27,993.54	3,770.59	3,862.05	7,926.57	2,390.66	259.33	1,123.80	136.49	2,710.63	108.06	162.11	267.50	8.38	221.65	128.50	752.93	412.95	66.97	543.26	18,477.44	801.44	5,274.29	11,652.75	14,234.58	29,221.74	132,508.23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	132,508.23
depr	554.20	59.50	243.47	318.29	457.25	88.91	463.75	48.02	457.61	17.46	11.11	93.55	1.25	107.44	53.99	631.28	188.73	34.29	81.68	794.06	717.71	1,472.39	7,482.37	1,070.36	68.71	15,517.36	0.00	0.00	0.00	0.00	0.00	0.00	0.00	15,517.36
tax	23.01	161.07	1.38	0.05	24.90	33.61	2,661.89	914.87	1,988.98	35.90	27.75	274.63	193.28	1,278.38	512.18	1,125.23	4,238.31	265.01	106.94	416.52	61.06	659.39	459.64	6.35	218.52	15,688.86	7,063.48	0.00	813.57	91.11	0.00	1,240.97	9,209.14	24,898.00
opsr	27,408.51	6,341.96	18,656.47	35,790.96	7,133.98	1,466.76	9,058.62	3,235.10	6,407.79	433.93	535.64	659.10	34.11	1,292.22	752.70	895.24	1,932.70	565.03	751.45	16,855.50	4,375.85	36,362.32	10,145.88	21,614.06	4,733.55	217,439.41	0.00	0.00	0.00	0.00	0.00	0.00	0.00	217,439.41
VA	55,979.25	10,333.12	22,763.38	44,035.87	10,006.79	1,848.61	13,308.05	4,334.48	11,565.01	595.36	736.61	1,294.79	237.02	2,899.68	1,447.37	3,404.67	6,772.70	931.30	1,483.33	36,543.52	5,956.06	43,768.39	29,740.64	36,925.35	34,242.52	381,153.86	7,063.48	0.00	813.57	91.11	0.00	1,240.97	9,209.14	390,363.00
Total	75,981.42	13,841.56	27,087.19	49,738.38	10,239.19	2,006.25	43,557.75	6,768.58	29,014.72	1,310.65	1,915.89	3,458.45	422.92	7,341.28	4,102.84	5,911.70	16,018.69	3,227.51	4,510.11	68,961.66	8,164.71	71,342.04	61,783.67	41,288.80	55,818.46	613,814.43	287,947.00	34,579.00	44,611.00	26,436.00	28,244.76	90,161.00	511,978.76	1,125,793.19

Source: Economic Analysis Division of the National Planning Commission of Nepal (courtesy P.L.Shakya).

Appendix 6

21 sector Input-Output Table of the UK Economy Used for Benchmarking the Dynamic General Equilibrium Model

	Agr	Coilgas	Metal	Manuf	Machin	Vhicls	Misman	Electri	Gasdstr	Water	Constr	Distrib	Transp	Commun	Finance	Rlstate	Servics	Pubadm	Edu	Hlthvet	Othrsrv	Institt	Cons	Gov	In v	Exp	Total
Agr	2714.7	0.0	0.1	11847.7	2.6	1.9	8.7	0.0	0.0	0.0	17.1	1450.2	33.2	0.6	0.0	62.3	40.4	1.0	88.3	27.7	52.7	69.3	5791	0	305	1758	24272.7
Coilgas	0.0	1068.1	0.0	5033.9	3.5	3.5	0.5	1794.6	3411.2	0.0	54.2	195.3	226.2	0.0	0.0	13.0	242.7	0.6	0.4	7.0	0.3	21.8	245	0	656	6852	19830.5
Metal	1.0	0.1	103.9	402.4	0.9	0.4	1.2	0.0	0.0	0.0	543.9	60.0	13.7	1.1	0.1	4.8	7.1		0.3	0.2	11.8	4.6	14	0	19	1699	2889.7
Manuf	4304.4	928.2	122.1	48443.7	9701.0	7061.0	2777.6	757.6	147.8	82.3	10940.5	15491.3	3297.7	912.3	2967.7	1011.4	4778.7	91.9	642.6	1701.4	2833.8	5099.4	42093	0	6665	60099	232950.9
Machin	34.3	293.5	82.7	2312.8	6994.4	1729.8	64.7	221.5	121.5	41.0	1106.9	1062.9	308.0	1070.2	57.4	80.8	598.0	70.3	11.0	441.3	150.1	1821.7	2703	0	8931	42980	73290.0
Vhicls	50.6	35.9	29.8	283.2	205.1	3082.2	83.4	9.9	0.0	4.7	95.1	1381.0	650.3	24.6	63.6	86.9	428.3	83.4	7.7	41.0	89.3	1420.8	8115	0	4606	19164	40041.8
Misman	12.6	0.0	0.0	1147.0	12.3	84.5	429.3	2.5	2.1	1.1	273.5	253.4	51.3	21.3	48.1	35.5	195.2	12.5	82.6	50.1	102.0	370.6	3369	0	2130	3189	11876.4
Electri	152.5	177.6	59.3	3208.6	591.6	351.1	114.5	9095.5	24.1	167.2	383.9	1179.4	425.4	113.2	227.4	77.0	560.3	18.9	57.8	221.8	150.7	576.3	6873	0	0	31	24837.4
Gasdstr	7.1	9.4	8.2	1026.2	97.3	51.4	19.3	921.9	1743.6	0.9	43.9	226.1	145.7	14.9	39.8	17.9	156.3	8.5	16.2	109.8	36.2	297.3	5371	0	-46	23	10345.2
Water	70.1	6.1	3.4	375.5	57.3	30.1	12.0	16.5	1.6	55.0	15.7	73.7	20.1	3.7	8.8	5.1	39.9	7.9	9.0	63.5	31.3	280.8	2135	0	-1	7	3328.0
Constr	199.5	956.8	18.8	630.1	93.2	45.6	40.0	27.7	31.5	141.2	21650.2	1023.9	196.8	362.5	1051.5	5494.2	555.1	195.5	42.2	171.0	192.1	3923.7	3036	0	47364	160	87602.4
Distrib	1419.5	224.5	98.8	11325.2	5433.0	2129.0	557.1	360.1	51.2	26.0	2051.7	5667.2	2229.3	544.5	1078.9	466.9	2509.9	64.0	293.2	544.1	762.5	2347.4	116237	0	4611	20789	181821.6
Transp	142.8	236.3	381.4	6054.4	1119.7	649.9	268.4	85.5	42.8	14.4	904.4	16751.0	15489.2	1071.4	3038.2	822.4	3412.5	48.5	301.4	542.3	983.3	1552.2	11981	0	633	8888	75414.1
Commun	169.3	65.6	12.9	1237.5	300.2	129.0	50.8	58.9	40.5	6.7	246.9	2782.5	813.1	1019.8	6132.0	820.0	2382.0	78.8	174.4	405.9	720.9	1672.7	7690	0	60	1301	28371.3
Finance	475.8	847.3	249.9	9054.5	2806.2	1273.5	504.0	554.0	287.4	199.3	1831.7	7613.9	3260.0	530.2	11134.7	2368.4	3614.8	84.5	152.2	373.6	1071.3	1728.0	21816	0	28	8070	79929.1
Rlstate	269.5	17.9	10.9	1207.3	464.9	118.3	113.5	44.3	235.8	6.2	3379.1	8147.4	1113.4	356.0	2596.4	1214.5	1166.9	50.4	64.3	297.8	444.9	1144.8	55914	0	1608	303	80289.8
Servics	818.4	1369.2	78.4	8934.4	2901.9	1701.0	450.8	457.1	194.2	90.3	6150.0	11267.2	6990.6	1385.4	10235.8	3372.3	22668.2	197.0	879.1	1577.6	4845.0	6840.4	7138	0	6814	16280	123635.7
Pubadm	16.4	8.4	1.5	52.7	15.4	5.6	3.1	3.3	2.5	0.8	15.1	19.1	113.4	2.4	2.7	922.2	565.4	0.1	0.2	1.0	5.7	8.7	949	0	652	622	3989.0
Edu	15.8	1.7	2.6	303.6	147.7	43.3	12.7	24.2	19.5	5.1	61.9	296.0	207.7	170.3	630.4	152.5	1144.1	81.4	525.4	165.0	334.7	1884.1	6355	0	0	753	13337.5
Hlthvet	177.3	1.6	2.3	270.8	132.2	39.5	12.8	21.6	17.8	4.6	100.1	363.7	133.7	80.7	224.5	43.0	265.2	2.7	53.4	1727.0	402.2	29664.2	5258	0	0	131	39129.7
Othrsrv	272.2	65.3	4.4	1820.6	273.1	92.2	54.2	42.5	30.7	8.6	100.0	795.0	403.6	244.7	456.9	144.9	1884.8	54.4	121.3	435.4	5472.1	4554.2	27326	0	1294	2889	48840.1
Institt	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	16481	141031	0	0	157512.0
Import	1493	832	360	37202	14915	9609	1978	889	1184	71	4600	10542	4742	2779	2759	780	7617	369	408	1674	3824	9841	51083	0	29947	7555	207051.5
Taxsub	300	140	53	1090	428	176	97	698	66	26	307	1479	2331	381	4806	563	508	214	523	1358	232	6087	51875	0	5564	-33	79268.0
Excise	-160	86	41	1230	324	144	78	599	446	187	359	5080	743	306	1257	-604	1806	46	92	19	464	1612	0	0	0	0	14156.0
Wages	2952	2293	750	56158	18146	9978	2908	2794	1553	653	15829	60487	22544	10798	17955	9252	39896	1929	7768	19584	14867	67624	0	0	0	0	386718.0
Capital	8473	10602	558	27334	9729	2260	1511	5629	846	1643	17552	32086	10461	6429	17879	53751	28144	278	1089	7664	11270	-16153	0	0	0	0	239034.0
Adj	-110	-437	-143	-5036	-1606	-747	-274	-270	-155	-107	-1011	-3952	-1531	-252	-4721	-668	-1551	0	-66	-74	-508	23220	0	0	0	0	0.0
Total	24272.7	19830.1	2889.9	232950.6	73290.0	40041.9	11876.4	24837.3	10345.2	3328.0	87602.4	181822.0	75413.3	28371.3	79929.1	80289.8	123635.7	3988.7	13337.5	39129.7	48840.1	157512.0	459848.0	141031.0	121839.0	203510.7	2289762.5

21 Sector Input-Output Table of the UK economy, Aggregated from 123 sector input-output Table from the Office of the National Statixtics, http://www.statistics.gov.uk/CCI/nscl.asp?ID=5940