Taxing the Mining Sector to Reduce Unemployment and Inequality in Namibia: Would it Work?

PRELIMINARY VERSION: PLEASE, DO NOT QUOTE

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Abstract

In this paper we evaluate the effects of raising tax rates on extractive industries (e.g., diamond and uranium mining) on unemployment rates for skilled and unskilled labor in Namibia, and income inequality at the national level. Using a Social Accounting Matrix for Namibia in 2004 we built a Computable General Equilibrium (CGE) model that accounts for two types of labor and six types of households based on location and income source. We analyze several scenarios where tax rates on mining activities are increased in order to subsidize other industries which are more apt to employ unskilled workers to examine resultant effects on employment, GDP, household welfare, and inequality levels. The results suggest that the mining sector has a significant impact on the whole economy and the negative effects of raising tax rates for these industries generally exceeds any positive employment-related effects of subsidizing other industries. Although taxation of the mining sector increases the economic well-being of rural households in certain scenarios, inequality generally remains high.

Keywords: Computable General Equilibrium, Namibia, Taxes, Employment, Inequality

JEL classifications: C63, C68, D63, E24

1. INTRODUCTION

Strong evidence indicates that national income inequality hinders the ability of economic growth to reduce monetary poverty, particularly in sub-Saharan Africa (SSA) (Fosu, 2009, 2011; Ravillion, 2009; Kalwij and Verschoor, 2007; Ali and Thorbecke, 2000; Easterly, 2000; Alesina and Rodrik, 1994). High rates of inequality have also been linked to non-monetary dimensions of poverty including the erosion of social support networks and weakened ability to cope with economic and environmental shocks (Leichenko and O'Brien, 2008; Silva 2008). Addressing persistent and rising rates of inequality in countries with economies highly dependent on natural resource revenues merits special attention, since research indicates that these areas are more vulnerable to violent conflict stemming from grievances over unequal distribution of resource-based revenues (LeBillon 2008).

Namibia provides an extremely useful case for studying the linkages between inequality, natural resource dependency, and poverty reduction in the developing world. Indeed, Fosu (2009) identifies Namibia as one of the SSA countries where poverty reduction is especially sensitive to income inequality. Although the World Bank (2014) classifies Namibia as a middle income country with an annual per capita income of X$, the level of inequality is the second highest in the world (Economist, 2014). Despite evidence of robust economic growth estimated at 4.5% increased GDP over the last decade, Levine (2011) finds that income inequality in Namibia has remained largely unchanged since the early 1990s. Moreover, the Namibian economy is heavily dependent on extractive industries, particularly diamond and uranium mining.

According to the OECD (2008), the mining sector accounted for 13 % of GDP in in 2008, with 9% from diamond mining alone. Diamond mining alone accounts for 9 % of GDP. The great performance of diamond industries, however, has not been enough to reduce the high unemployment rate for unskilled workers, which was over 30 % in 2004 (Mwinga, 2012). The mining extraction and processing sectors employ less that 2% of the population (CIA 2014). Namibia is ranked as having the highest employment per capita in the world (Economist 2013). There is a significant lack of skilled workers despite the high investment in education implemented by the government, which keeps the unemployment rate these workers below 5% (Mwinga, 2012).

A high dependence of the economy on the mining sector can lead to unstable economic growth and unexpected declines of diamond extractions may cause a significant drop in GDP. In order to avoid this possibility, the government is trying diversifying its

economy by strengthening tourism and other related industries (GRN, 2004). Namibia has been ranked as the sixth fastest growing touristic industry in the world by the World Travel and Tourism Council and it represents 17 % of GDP (WTTC, 2012). The number of tourism arrivals is growing and also the number of facilities.

In this context, the main objective of the paper is to evaluate how different types of taxation policies on the mining sector affect employment and household welfare. We simulate the economy-wide effects of four different scenarios where increased taxes on the mining sector are used to subsidize 1) subsistence agriculture, 2) subsistence fishing, 3) tourism-related industries, and 4) provide cash transfers to rural households primarily reliant on subsistence agriculture and social grants. The general equilibrium effects obtained with the Computable General Equilibrium (CGE) model elaborated by the authors are linked to a micro database on household's income in order to examine the effects of different taxation scenarios on income inequality. We pay especial attention to distributional effects of these policies since Namibia is one of the most unequal societies in the world.

The rest of the paper is organized as follows. The description of the model and the database is detailed in Section 2. Section 3 presents the results for four different scenarios and the results on inequality derived from the micro data. Section 4 concludes.

2. METHODOLGY

2.1 The SAM Database

Our analysis uses a modified version of the SAM for Namibia, SAMNAM-04 hereafter, constructed by Lange and Schade (2009) for the years 2003-2004. This is the only available SAM for the Namibia and has been used in other studies (Sahlén and Stage, 2012, Humavindu and Stage, 2013). In the modified SAM, we have aggregated some of the industries and commodities included in the original version (Table 1). Additionally, since we are not interested in the effects of trade policies, we have assign transport margins in the supply table to the final product named Trade, such as total supply and total demand do not change. Additionally, we have merged Gross Mixed income together with Gross Operating Surplus. This is a common presentation of data in National Accounts. These changes do not make any substantial change in the database, but they facilitate the construction of the model according to the aim of the paper.

Unlike in Lange and Schade (2009), nonresidents consumption and residents consumption abroad are included as part of final demand. These magnitudes appear in the

new version of the SAM as transfers from the Row to an agent named Nonresidents consumers, which use these transfers to pay for consumption commodities. On the other hand, residents' consumption out of the territory is included in the SAM as a transfer from households to the ROW.

Unemployment rates have been calculated using the information from Mwinga (2012). In our model, the skilled labor unemployment rate (3.8%) has been calculated as the average of the unemployment rate for the last four cells in Table 2 for the year 2004. In the case of unskilled labor, 37.2%, it has been calculated using the average of unemployment rates for the first four levels of education in the Table: No education, Primary School, Junior Sec School and Senior Sec School. The price of capital is fixed as a *numeraire*.

Finally, taxes on imports have been disentangled from other taxes on products using tax rates from Mevel and Karingi (2013) and applying them to imports. The resulting number have been extracted from other taxes on products.

Table 1: Unemployment rate by education attainment (%)

	1997	**2000**	**2004**	**2008**
No Education	12.5	7.7	33.2	53
Primary School	44.2	38.4	41.4	59.9
Junior Sec School	30.1	35.5	43.2	57.3
Senior Sec School	11.8	16.5	31	41.5
Education after Std 10	0.4	0.5	7.3	15.8
University 1st Degree	0.2	0.1	4.1	14.3
Post graduate Degree	0.1	0.1	2.7	4.4
Teachers Training	0.1	0	0.9	5

Source: Mwinga (2012)

There are six representative households, three rural and three urban, classified by main source of income (see Table 2).

Table 2. Household Categories

URBAN	**Main source of income**	**RURAL**	**Main source of income**
H1	Wages & Salaries in cash	**H4**	Wages & Salaries in cash
H2	Business activities including farming	**H5**	Business activities and commercial farming
H3	Pensions, cash remittances and other sources of income	**H6**	Subsistence farming, pensions, cash remittances and other sources of income

Source: Lange and Schade (2009)

2.2. The CGE Model.

Using the SAMNAM-04 database, we calibrate our model to evaluate the impact of several potential fiscal policies aimed to increase the demand for unskilled labor, improve household welfare as measured by consumption via increased taxation on the mining sector. There are 29 industries, 2 types of Labor (skilled and unskilled), a capital account, and 6 types of households, one non-resident consumer, one Government account and the Rest of the World. The components of the model are described below.

Production and price functions

Total supply is a Constant Elasticity of Substitution (CES) aggregate of domestic production and imports from the Rest of the World[1] (RoW). Domestic production is a Leontief combination of intermediate inputs and value added and value added is a Cobb-Douglas function of labor and capital. There are not taxes on labor (social security contributions of employers and employees) in the database and neither are they in the model. The minimization program at the lowest level of the nest is:

$$\min wL_j + rK_j \ s.t. \ V_j = \gamma_j L_j^{\beta_{lj}} K_j^{(1-\beta_{lj})} \qquad (1)$$

Where γ_i is a scale parameter, L_j is labor, K_j capital and β_{lj} the redistributive parameter. Firms minimize their costs subject to the value added constraint and derived labor and capital demand. In the second level of the nest, intermediate and value added demands satisfies the following restrictions:

$$X_{ij} = a_{ij} Y_{dj} \text{ and } V_j = v_j Y_{dj} \qquad (2)$$

Where a_{ji} and v_i are technical and unitary requirement coefficients of intermediate inputs and value added and Y_{dj} represents domestic production.

[1] The database does not distinguish between South Africa and the RoW despite that 90 percent of the imports come from this country.

Prices are also a CES combination of domestic production prices $\left(p_{dj}\right)$ and import prices $\left(p_{rowj}\right)$ with taxes $\left(t^{row}\right)$. Total supply is subject to taxes on products net of subsidies $\left(t^{otpr}\right)$

$$p_j = \left[\left(\frac{p_{dj}\left(1+\tau_j^{otpr}\right)}{A_{dj}} \right)^{1-\sigma_j} + \left(\frac{p_{rowj}\left(1+\tau_j^{m}\right)\left(1+\tau_j^{otpr}\right)}{A_{rowj}} \right)^{1-\sigma_j} \right]^{\frac{1}{1-\sigma_j}} \quad (3)$$

The constants A_{dj} and A_{rowj} are used in the model to define the demand of domestic products and imports. Additionally, domestic prices include net taxes on production.

$$p_{dj} = \left(\sum_i^{29} p_i a_{ij} + p_{vj} v_j \right)\left(1+t_p\right) \quad (4)$$

The price of value added is obtained from costs minimization as a result of the Cobb-Douglas combination of labor and capital.

Households´ consumption and savings

In the model, households maximize a Cobb-Douglas utility function of consumption and saving subject to budget constraints. Gross income is composed by labor and capital income, current transfers from Government, from the Corporations[2] and from other households. Disposable income is obtained deducting personal income tax and current transfers paid.

Public deficit

Tax revenues on production, products and imports are collected by the central government. Additionally, the government also collects taxes on corporate and personal income and receives transfers from households and corporations. Public consumption and tax rates are exogenously determined while public savings is an endogenous variable, which is calculated as a residual from public revenues less consumption and transfers made to other agents. In this case, public savings are equivalent to public deficit.

[2] The corporate sector is an intermediate agent that receives incomes from other agents, pays transfers and taxes and saves.

The Rest of the World

There is one foreign sector, the Rest of the world (RoW). This sector obtains revenues from imports $\left(Y_j^{row}\right)$, labor $\left(\bar{L}_l^{rown}\right)$ and capital income $\left(\bar{K}^{rown}\right)$ from Namibia to the RoW and from residents´ consumption out of the country $\left(RC^{rown}\right)$. These revenues are used to pay exports $\left(Ex_j^{row}\right)$, nonresidents consumption $\left(NRC_j\right)$, labor $\left(\bar{L}_l^{nrow}\right)$ and capital income $\left(\bar{K}^{nrow}\right)$ from the RoW to residents plus the difference between current transfers to Government $\left(TR^{nrow}\right)$. The foreign current balance $\left(FCB\right)$ is and endogenous variable calculated as the difference between revenues and expenditures.

$$FCB = \sum_{j=1}^{29} p_j Y_j^{row} - \sum_{j=1}^{29} p_j Ex_j^{row} + \sum_{l=1}^{2} w \cdot \bar{L}_l^{rown}\left(1-u_l\right) - w \cdot \bar{L}_l^{nrow} + r \cdot \bar{K}^{rown} - r \cdot \bar{K}^{nrow} \quad (5)$$

Where u_l is the unemployment rate by kind of labor and cpi is the consumer price index. In this model, the exchange rate is fixed and equal to one. Namibia is member of the Common Monetary Area3 (CMA). There is a bilateral agreement between Namibia and South Africa whereby Namibia requires backing its currency fully with foreign exchange reserves. Additionally, South Africa is Namibia's first import partner, it is the origin of 80 % of its imports, and it absorbs 30 % of Namibian's exports4. Hence, the assumption of a fixed exchange rate seems to be appropriate.

Wage equation

In the model, there is a real wage equation rate that accounts how much real wages react to changes in the unemployment rate. It can be interpreted as a restriction on prices.

$$\frac{w}{cpi} = k_l\left(1-u_l\right)^{\frac{1}{\eta_l}} \quad (6)$$

The informal economy in Namibia represents a high proportion of GDP. In this model we have included a real wage equation that does not affect the informal economy. We are

[3] The CMA is composed by South Africa, Lesotho, Swaziland and Namibia and their dollars are pegged to South Africana rand on a one to one basis. Monetary policy is longer determined by South Africa.
[4] Basically diamonds, beef and grapes

assuming that real wages for those employees engaged in the legal labor market will react to changes in the unemployment rate according to parameter η. In the model, η is exogenously fixed and equal to 1.2. The higher the value of this parameter is, the lower the adjustment in wage rate.

Private Investment

This is a savings-driven model where the aggregation of private and public savings determines investment. The equilibrium condition is

$$p_I \sum_{j=1}^{29} I_j = p_I \sum_{h=1}^{6} S_h + S_{corp} + S_g + FCB \quad (7)$$

Where p_I is an index of final prices weight by the commodities investment. S_{corp} and S_g are corporate savings and public deficit, respectively.

2.2. Income Inequality Analysis

In order to further examine the effects of various redistributive taxation policies on the Namibian economy, we calculate inequality levels under our four different scenarios and compare them with actually inequality levels for the country. The income inequality analysis is conducted using the nationally-representative Namibian Household Income and Expenditure Survey (NHIES) conducted by the Central Bureau of Statistics for 2003-2004, the same years for which the SAMNAM-04 was constructed. The NHIES survey involves a stratified two-stage cluster sample design, where the first stage units were geographical areas designated as primary sampling units (PSUs) and the second stage units were the households. The PSUs were the same as those used in the Namibian 2001 Population and Housing Census. The sample households were selected from the PSU population using a systematic sampling procedure. The dataset includes information for 4,801 households. The net household income data include annual income from 1) livestock or produce sold (minus the value of expenditures on seeds, feed, and any other costs for goods and services used for own production); 2) wages and salaries from full or part-time employment (minus any deductions made by the employer); 3) self-employment from full or part-time activities (minus business expenditures); 4) social grants and pensions; 5) cash allowances, 6) rental income or payments from borders; 7) insurance or inheritances received; 8) gambling revenues; 9)

revenue received from the sale of property or assets; 10) tax refunds; and 11) all other income not otherwise specified.

We employ the Gini index as our measure of inequality as it is the one most commonly used in the literature (citation) and allows for greater comparability of our results with other analysis, particularly those that examine income inequality in Namibia. The Gini decompositions were carried out using the Distributive Analysis STATA package (DASP) (Duclos and Araar 2012). We decompose the Gini index by population subgroups based on the six household categories identified in the SAMNAM-04 in order to determine the contribution of each subgroup to total population inequality and how this changes for each of our simulations. The Gini index decomposition equation can be expressed as follows:

$$I = \underbrace{\sum_{g=1}^{G} \phi_g \varphi_g I_g}_{Between} + \underset{Withing}{\bar{I}} + \underset{Overlap}{\bar{R}}$$

Where:

I = The Gini index

G = The total population of subgroups g

ϕg = The population share of group g;

Φg = The income share of group g;

Ig = The Gini index for group g

$\bar{I}$= The between group inequality (when each individual has the average income of its group);

R = The residue implied by group income overlap

We employ this method to decompose the Gini index by population subgroups to see how inequality changes among our six household categories in response to the simulated tax increases on the mining sector and reallocation to other industries or, in the case of simulation 4, government transfers to subsistence farmers. All income values in used in the Gini calculations are expressed as annual per capita net income. Although consumption measures are more commonly used in inequality analyses for developing countries, we use net household income in order to adjust these values based on the CGE model simulation results for changes in net disposable household income in each of the four taxation scenarios. All

income figures were adjusted by employing a commonly used adult-equivalence scale5. Following the method outlined in Schmidt (2009), household sample weights are adjusted for household size (i.e. the data is weighted by individuals) due to the tendency of poorer households to be larger than wealthier ones. The use of adjusted sampling weights avoids underestimating the extent of poverty among the population.

3. RESULTS

This section presents the general equilibrium effects of raising 15% taxes on diamonds (equation 3) in four different scenarios and the impact each scenario has on unemployment and household consumption. We then apply our results from the CGE model to a national representative household income and expenditure survey for 2003-2004 to examine the effect of each scenario on income inequality.

3.1 CGE Model Results

In the first scenario (SC1), the extra revenues generated by a 15% increase in taxation rates for the mining sector are redistributed to subsidize capital in traditional agriculture. According to the SAMNAM-04, there are not unskilled employees working in this sector since the labor income generated in traditional agriculture[6] is mixed with capital revenues. In the database, this information is registered in the account "Gross Operating Surplus/ Mixed income". Thus, labor and capital cannot be properly disentangled. This simulation is the most appropriate to evaluate the effect of subsidies in traditional agriculture and their impact on inequality. In the second scenario (SC2) the extra-revenues from taxing mining are used to subsidize unskilled labor in the traditional fishing sector and in third scenario (SC3) the additional taxation revenues are used to subsidize hotels and restaurants which are two main tourism-related sectors represented in the SAMNAM-04. Finally, scenario SC4 distributes the additional mining tax revenues as a lump sum transfer to rural households, which rely on subsistence farming.

[5] Analyses of poverty and inequality using income and expenditure data routinely make adult equivalence scales (White and Masset 2002). As Schmidt (2009) notes adult-equivalence scales are used to adjust for the fact that a child has lower consumption needs than an adult, and will therefore require less income than an adult to maintain the same quality of life. In this analysis we slightly modify the scaling factor used by Schmidt (2009) and Levine et al. (2011) given that the publically available data do not include individual ages for household members. Thus we use a household age grouping variable instead. Our scaling weights assigned an adult equivalency value of .5 to children ages 0 to 4, .75 to children ages 6-14, and 1 for all those aged 15 or older

[6] The SAMNAM-04 does not account for self-employees in Traditional agriculture. They are not taken into account in the unemployment rate.

Table 3 summarizes the effects of the four different scenarios in central macroeconomic variables. Tables 4 and 5 present the variation in domestic production and consumer prices. All results are in percentage of variation unless unemployment, which appears as the resulted unemployment rates.

Scenario 1: Taxing Mining to Subsidize Agriculture

As previously described, in this scenario the extra revenues from the tax increase on mining products are allocated to subsidize capital in traditional agriculture. The effects of this fiscal reform do not directly affect unskilled labor since workers in this sector are not accounted for as employees in the SAM. Labor and capital income obtained by workers in Agriculture are accounted for in as Mixed Income, which contains both type. The tax increase raises prices on "Mining", "Manufacture of basic metals", "Manufactures of fabricated metals and machinery", "Manufactures of goods", etc, as shown in Table 5. The increase of prices only raises the consumer price index (CPI) by 0.5%. However, this increase together with the reduction of net disposable income in Household Category H1 reduces consumption (Table 3). The effects of subsidies in traditional agriculture do not counteract the negative impact of mining on labor and capital revenues and decrease net disposable income in H1, in which main incomes are wages and salaries. The income variation is transferred to consumption, meaning that the model assumes higher hosuehold income leads to more consumption. The fall in consumption reduces imports and the variations in prices raise exports.

Changes in these nominal variables (e.g., values represented in real terms), together with the increase of nonresidents' consumption lead the foreign current balance to increase by 12%. The amount of savings sent from Namibia to the ROW is bigger than in the benchmark, in this case the base year 2004. The increase of savings sent to the ROW and the fall in private savings- public deficit is fixed in the model- and leads to a reduction in investment of 2.57%. In this scenario, the increase in mining taxes, basically associated to diamonds, does not reduce the high unemployment rate in Namibia for unskilled labor but, on the contrary, it may raise the level of unemployed among high qualified workers due to the negative effects on investment. On the other hand, it is likely that variations in unskilled labor may take place in the informal economy, which cannot be observed with a CGE since the information is not included in National Accounts data. So subsidizing traditional agriculture could theoretically increase informal employment, such as temporary agricultural labour employed during planting and harvesting seasons. Table 4 also shows the variation in domestic production. The biggest fall is in those industries that are more investment dependent.

Table 3: Main macroeconomic variables. (in percentage)

	Benchmark	SC1	SC2	SC3	SC4
Nominal GDP	37,689.1	-0.01	0.14	0.20	0.17
Real GDP	37,689.1	**-0.07**	**0.06**	**-0.01**	**-0.09**
Private Net Income					
Net Income H1	10,739.200	-0.07	0.32	0.41	0.08
Net Income H2	1,805.750	0.04	0.05	0.29	0.27
Net Income H3	1,083.960	0.05	0.05	0.32	1.13
Net Income H4	2,728.810	-0.03	0.22	0.38	0.17
Net Income H5	1,390.590	0.01	0.02	0.12	0.11
Net Income H6	3,234.220	0.03	0.05	0.23	1.19
Nonresidents consumption	2,748.970	0.18	0.07	-0.74	0.25
Government current consumption	10,142.840	0.06	0.13	0.30	0.20
Investment	8,834.430	-2.57	0.25	-1.98	-2.71
Exports	14,458.170	0.54	0.07	0.65	0.61
Imports	19,477.820	-0.71	0.19	-0.39	-0.60
Foreign current balance	-1,826.22	12.26	-1.31	8.75	12.23
Employment					
Skilled labor	-	-0.10	0.00	-0.09	-0.17
Unskilled labor	-	-0.06	0.28	0.17	-0.12
Households utility					
Utility H1	-	-0.33	0.26	0.08	-0.24
Utility H2	-	-0.23	-0.01	-0.06	-0.06
Utility H3	-	-0.18	0.00	0.04	0.83
Utility H4	-	-0.07	0.17	0.05	-0.16
Utility H5	-	-0.15	-0.04	-0.23	-0.24
Utility H6	-	0.88	0.03	-0.01	0.95
CPI	1.00	0.05	0.05	0.31	0.31
Unemployment rates					
Unemployment					
Skilled labor	3.80	3.90	3.80	3.89	3.96
Unskilled labor	37.20	37.24	37.03	37.09	37.27

SC1: 15% increase in taxes on products (mining) to subsidize GOS/MI in traditional agriculture.

SC2: 15% increase in taxes on products (mining) to subsidize unskilled labor in fishing

SC3: 15% increase in taxes on products (mining) to subsidize unskilled labor in tourism-related industries

SC4: 15% increase in taxes on products (mining) to increase current transfers to rural households.

Table 4: Variation in domestic production

		SC1	SC2	SC3	SC4
I1	Commercial cereal crops	0.66	0.15	0.87	1.01
I2	Commercial Other crops	0.46	0.11	0.66	0.65
I3	Commercial animal products	0.27	0.05	0.28	0.27
I4	Traditional agriculture	3.92	0.06	0.17	0.91
I5	Fishing	0.00	0.07	0.01	0.02
I6	Mining	-0.06	-0.02	-0.04	-0.07
I7	Meat processing	0.28	0.08	0.44	0.40
I8	Fish processing	-0.01	0.05	0.00	0.01
I9	Grain milling	-0.07	0.10	0.11	0.27
I10	Manufacture of beverages, other food	0.16	0.12	0.38	0.41
I11	Manufacture of textiles, etc.	0.69	0.16	0.94	0.92
I12	Manufactures of wood; Furniture, etc.	-0.17	0.09	0.02	-0.24
I13	Paper; printing and publishing	0.58	0.07	0.69	0.62
I14	Manufactures of chemicals, rubber, plastic	0.39	0.09	0.55	0.48
I15	Man of other non-metallic mineral products	-1.27	-0.07	-0.93	-1.32
I16	Manufactures of basic metals	-1.56	-0.14	-1.23	-1.68
I17	Manufactures of fabricated metal products	-0.13	0.07	0.09	-0.19
I18	Electricity	-0.06	0.07	0.14	0.00
I19	Water	-0.15	0.11	-0.01	-0.12
I20	Construction	-2.80	0.17	**-2.31**	**-2.99**
I21	Trade; repairs	0.13	0.09	0.32	0.20
I22	Hotels and restaurants	-0.04	0.03	0.44	0.01
I23	Transport	-0.07	0.06	0.07	-0.02
I24	Communication	-0.12	0.09	0.07	-0.04
I25	Finance and insurance	-0.23	0.11	0.00	-0.15
I26	Own Real estate	-0.03	0.21	0.35	0.35
I27	Market real estate and Business services	-0.52	0.09	-0.28	-0.52
I28	Other private and social services	-0.08	0.04	0.00	-0.03
I29	Government services	-0.01	0.01	0.00	0.00

SC1: 15% increase in taxes on products (mining) to subsidize GOS/MI in traditional agriculture.

SC2: 15% increase in taxes on products (mining) to subsidize unskilled labor in fishing

SC3: 15% increase in taxes on products (mining) to subsidize unskilled labor in tourism-related industries

SC4: 15% increase in taxes on products (mining) to increase current transfers to rural households.

Table 5: Variation in consumer prices

		SC1	SC2	SC3	SC4
I1	Commercial cereal crops	0.27	0.05	0.35	0.32
I2	Commercial Other crops	0.30	0.06	0.40	0.36
I3	Commercial animal products	0.07	0.03	0.11	0.11
I4	Traditional agriculture	**-3.75**	0.01	0.08	0.07
I5	Fishing	0.15	**-1.98**	0.31	0.23
I6	Mining	0.95	0.88	1.05	1.02
I7	Meat processing	0.19	0.05	0.27	0.24
I8	Fish processing	0.11	**-1.43**	0.27	0.20
I9	Grain milling	0.14	0.04	0.22	0.19
I10	Manufacture of beverages, other food	0.26	0.06	0.37	0.33
I11	Manufacture of textiles, etc.	0.33	0.06	0.43	0.40
I12	Manufactures of wood; Furniture, etc.	0.40	0.07	0.51	0.47
I13	Paper; printing and publishing	0.39	0.07	0.52	0.47
I14	Manufactures of chemicals, rubber, plastic	0.36	0.07	0.48	0.44
I15	Man of other non-metallic mineral products	0.40	0.13	0.51	0.47
I16	Manufactures of basic metals	0.42	0.21	0.51	0.49
I17	Manufactures of fabricated metal products	0.42	0.07	0.53	0.49
I18	Electricity	0.10	0.05	0.17	0.16
I19	Water	0.05	0.05	0.15	0.11
I20	Construction	0.26	0.09	0.35	0.32
I21	Trade; repairs	0.08	0.07	0.21	0.16
I22	Hotels and restaurants	0.12	0.06	**-2.24**	0.18
I23	Transport	0.23	0.07	0.34	0.30
I24	Communication	0.12	0.06	0.22	0.18
I25	Finance and insurance	0.17	0.05	0.26	0.23
I26	Own Real estate	0.00	0.00	0.00	0.00
I27	Market real estate and Business services	0.18	0.04	0.25	0.23
I28	Other private and social services	0.12	0.11	0.31	0.25
I29	Government services	0.05	0.13	0.29	0.20

SC1: 15% increase in taxes on products (mining) to subsidize GOS/MI in traditional agriculture.

SC2: 15% increase in taxes on products (mining) to subsidize unskilled labor in fishing

SC3: 15% increase in taxes on products (mining) to subsidize unskilled labor in tourism-related industries

SC4: 15% increase in taxes on products (mining) to increase current transfers to rural households.

Scenario 2: Taxing Mining to Subsidize Fishing

In scenario 2 (SC2), we simulate the subsidizing unskilled labor in the fishing sector with the extra revenues generated from higher taxes on the mining sector. This policy has more positive effects on employment and real GDP than in scenario 1 which focused on subsidizing the agricultural sector. The subsidy increases the labor demand of unskilled labor in fishing without affecting skilled labor and compensates for the negative impact that the tax increase has on unemployment in unskilled labor in the mining sector. Employment for unskilled worker increases in 0.28% and the unemployment rate drops from 37.2 to 37%. This variation increases households' income in categories H1 and H4 and to lesser extent in other household types. Rural and urban households with wages as a main income source are the most affected. Consumption in Household H6 increases only in 0.05% and the effect is even smaller in terms of utility. Regarding those households more dependent on business activities, categories H2 and H5, their utility falls due to a decrease in private savings. In this case, the effects on prices are smaller than in the previous scenario, they only fall for fishing and fishing-related activities by 1.98 and 1.43%, respectively (See Table 4). CPI does not change. In this scenario, the foreign current balance falls in 1.31% due to the increase of imports in relation to exports

Scenario 3: Taxing Mining to Subsidize Tourism-Related Industries

In the third scenario (SC3), the effects on real GDP, investment and Skilled labor are more similar to those in SC1. The extra-revenues are targeted to unskilled labor subsidies in tourism related industries. Nominal GDP grows in 0.20%, unskilled employment raises 0.17% and private consumption also increase in all households. Consumer prices rise around 0.3-0.5% in all sectors unless in Hotels and restaurants, which falls in 0.3%. The variation in prices is translated to CPI, which raises 0.31%. The increase of prices has a negative effect on domestic production, but the increase of unskilled labor and households' income counteract this negative impact. It is only rural households, which depend on subsistence farming, what falls in 0.74% in consumption. This scenario does not seem to be the most appropriate if the aim of the policy is to increase poorest households' welfare. There are almost negligible variations for households H3 (0.04%) and H6 (-0.01%). The increase of demand raises domestic production in hotels and restaurants (0.44%), commercial crops (0.87-0.66%), Manufacture of textiles (0.94), Paper and printing (0.69%). etc. On the other hand, there is a fall in production in those industries more investment-oriented like Construction, -2.31%, Manufacture of basic metal, -1.23%, etc. Imports fall by 0.39%, which increases the

available amount of resources that can be sent from Namibia to the rest of the world. Hence, the FCB increases by 8.75%.

Scenario 4: Taxing Mining to Subsidize Rural Households in Category 6

If the main objective of raising taxes on diamonds is to improve rural households' welfare, an alternative policy would be to transfer directly to these households all the extra revenues generated. The results of simulation four (SC4) are presented in the last column of Tables 3-5. As in SC3, nominal GDP increases in 0.17%. The higher disposable income and the increase of prices raises consumption, presented in nominal terms, in the affected households, H3 and H6, in 1.13 and 1.19%, respectively. On the other hand, the negative effects of raising diamonds taxes without subsidizing any kind of labor leads to reduce employment in 0.17 and 0.12% for skilled and unskilled workers. The impact on labor is translated to households' income in those household's more dependent on wages and salaries and other business, including farming. The negative impacts lead to a reduction in households savings, and consequently in utility. The variation in savings affects investment, what falls in 2.71%. The cut down in investment is affecting domestic production. In Table 3 we can see how domestic production in investment-oriented sectors drops in 3-1.3 percentage points. The effect of this policy increases CPI in 0.31%, which increases public expenditures and transfers and reduces Government savings.

3.2. Income Inequality under Four Taxation Scenarios

Tables 6-10 show the Gini index decomposition results by household group for net income inequality using the NHIES 2003/2004 survey data. Table 6 presents the Gini index using the actual values provided in the survey, and Tables 7-10 present the Gini index values under each of the different taxation scenarios. One important thing to note is that Gini coefficient for each subpopulation of households remains the same in all five decomposition analyses. This is due to the fact that the changing rate for net household income generated in the CGE analyses is applied equally to all households within each classification group. Population shares in each of the six household category subgroups also remains the same since households are always classified according to their main source of income in the NHIES. Therefore, in our analysis, changes in overall inequality is driven by shifts in the share of income of total income received by each household group relative to their population share and subpopulation Gini coefficient.

Baseline Scenario: NHIES 2003/2004 Reported Net Household Income Values

Our Gini index value of .719 for the actual net income values reported in the NHIES survey indicates a very high level of inequality at the national level (Table 6). Although higher than other reported Gini index values using household consumption as the income measure, our findings comport with studies using net household income from the NHIES 2003/2004 survey (cf. Levine et al., 2011).[7] Looking at the Gini index coefficients for each of the six households subgroups, our findings indicate that inequality is high within each category, including rural households that rely primarily on subsistence farming, social grants, pensions, and remittances (H6). Moreover, the income distribution of households in this category makes a larger contribution to both absolute and relative inequality than that of any other grouping. This is largely due to the high population share of households within this subgroup (which includes over 50% of the population) coupled with the high Gini coefficient for the subgroup. These findings roughly comport with those of Schmidt (2009) who finds that, for example, income (as measured by household consumption) is more unevenly distributed among households identifying pensions as their primary source of income, than it is among urban and rural households identifying wages and salaries as their primary source of income. Still the level of income received by households varies substantially between groups as evidenced by the high contribution of between-group inequality to the overall Gini coefficient. For example, the subgroup of urban households with wages and salaries as their primary source of income (H1) include only 24% of the population but receive almost half (48%) of all income. Indeed the contribution of between-group inequality is more than double that of within-group inequality.

[7] Levine et al. (2011) report a Gini index coefficient of .739 for household income inequality, but used a slightly different adult equivalence scale when calculating per capita income.

Table 6: Gini index Decomposition by Household Groups: Actual Household Net Income Values

Household Group	Gini index	Population share	Income share	Absolute contribution	Relative contribution
H1	**0.552**	**0.241**	**0.486**	**0.065**	**0.090**
	0.018	*0.014*	*0.037*	*0.008*	*0.012*
H2	**0.711**	**0.034**	**0.072**	**0.002**	**0.002**
	0.043	*0.005*	*0.023*	*0.001*	*0.001*
H3	**0.673**	**0.039**	**0.036**	**0.001**	**0.001**
	0.037	*0.004*	*0.007*	*0.000*	*0.000*
H4	**0.580**	**0.122**	**0.147**	**0.010**	**0.014**
	0.016	*0.009*	*0.019*	*0.002*	*0.003*
H5	**0.836**	**0.029**	**0.050**	**0.001**	**0.002**
	0.033	*0.004*	*0.023*	*0.001*	*0.001*
H6	**0.712**	**0.535**	**0.209**	**0.080**	**0.111**
	0.047	*0.018*	*0.038*	*0.020*	*0.027*
Within	**.**	**.**	**.**	**0.159**	**0.220**
	.	.	.	.	.
Between	**.**	**.**	**.**	**0.373**	**0.518**
	.	.	.	.	.
Overlap	**.**	**.**	**.**	**0.188**	**0.261**
	.	.	.	.	.
National Gini index	**0.719**	**1.000**	**1.000**	**0.719**	**1.000**
	0.011	*0.000*	*0.000*	*0.011*	*0.000*

[-] Standard errors are in italics.

Source: Authors' calculations using the NHIES 2003/2004 survey data.

Scenario 1: Taxing Mining to Subsidize Agriculture

Table 7: Gini index Decomposition by Household Groups: Household Net Income Values under Simulation 1 (SC1)

ousehold Group	Gini index	Population share	Income share	Absolute contribution	Relative contribution
H1	**0.552**	**0.241**	**0.464**	**0.062**	**0.086**
	0.018	*0.014*	*0.037*	*0.008*	*0.011*
H2	**0.711**	**0.034**	**0.077**	**0.002**	**0.003**
	0.043	*0.005*	*0.024*	*0.001*	*0.001*
H3	**0.673**	**0.039**	**0.039**	**0.001**	**0.001**
	0.037	*0.004*	*0.008*	*0.000*	*0.000*
H4	**0.580**	**0.122**	**0.147**	**0.010**	**0.015**
	0.016	*0.009*	*0.019*	*0.002*	*0.003*
H5	**0.836**	**0.029**	**0.051**	**0.001**	**0.002**
	0.033	*0.004*	*0.023*	*0.001*	*0.001*
H6	**0.712**	**0.535**	**0.222**	**0.085**	**0.118**
	0.047	*0.018*	*0.039*	*0.021*	*0.029*
Within	**.**	**.**	**.**	**0.161**	**0.225**
	.	.	.	.	.
Between	**.**	**.**	**.**	**0.357**	**0.498**
	.	.	.	.	.
Overlap	**.**	**.**	**.**	**0.198**	**0.276**
	.	.	.	.	.
National Gini index	**0.715**	**1.000**	**1.000**	**0.715**	**1.000**
	0.012	*0.000*	*0.000*	*0.012*	*0.000*

[-] Standard errors are in italics.
Source: Source: Authors' calculations using the NHIES 2003/2004 survey data and CGE model results.

Main point for SC1 inequality findings: Overall inequality changes very little under this scenario. Income share decreases slightly for H1 and even less so for H2; increases slightly for H3 and a little more for H6, but these changes largely offset each other in terms of contributions to inequality when taking into account populations shares (very few households in H2 and H3). Between-group inequality is still more than double within-group inequality

Scenario 2: Taxing Mining to Subsidize Fishing

Table 8: Gini index Decomposition by Household Groups: Household Net Income Values under Simulation 2 (SC2)

Household Group	Gini index	Population share	Income share	Absolute contribution	Relative contribution
H1	**0.552**	**0.241**	**0.532**	**0.071**	**0.097**
	0.018	*0.014*	*0.036*	*0.008*	*0.012*
H2	**0.711**	**0.034**	**0.063**	**0.002**	**0.002**
	0.043	*0.005*	*0.020*	*0.001*	*0.001*
H3	**0.673**	**0.039**	**0.031**	**0.001**	**0.001**
	0.037	*0.004*	*0.006*	*0.000*	*0.000*
H4	**0.580**	**0.122**	**0.149**	**0.011**	**0.015**
	0.016	*0.009*	*0.019*	*0.002*	*0.003*
H5	**0.836**	**0.029**	**0.042**	**0.001**	**0.001**
	0.033	*0.004*	*0.020*	*0.001*	*0.001*
H6	**0.712**	**0.535**	**0.182**	**0.069**	**0.095**
	0.047	*0.018*	*0.034*	*0.018*	*0.024*
Within	**.**	**.**	**.**	**0.154**	**0.212**
	.	.	.	.	.
Between	**.**	**.**	**.**	**0.411**	**0.565**
	.	.	.	.	.
Overlap	**.**	**.**	**.**	**0.163**	**0.223**
	.	.	.	.	.
National Gini index	**0.728**	**1.000**	**1.000**	**0.728**	**1.000**
	0.010	*0.000*	*0.000*	*0.010*	*0.000*

[-] Standard errors are in italics.
Source: Authors' calculations using the NHIES 2003/2004 survey data and CGE model results.

Inequality actually increases under this scenario and between-group inequality increases quite a bit

Scenario 3: Taxing Mining to Subsidize Tourism-Related Industries

Table 9: Gini index Decomposition by Household Groups: Household Net Income Values under Simulation 3 (SC3)

Household Group	Gini index	Population share	Income share	Absolute contribution	Relative contribution
H1	**0.552**	**0.241**	**0.512**	**0.068**	**0.094**
	0.018	*0.014*	*0.036*	*0.008*	*0.012*
H2	**0.711**	**0.034**	**0.069**	**0.002**	**0.002**
	0.043	*0.005*	*0.022*	*0.001*	*0.001*
H3	**0.673**	**0.039**	**0.035**	**0.001**	**0.001**
	0.037	*0.004*	*0.007*	*0.000*	*0.000*
H4	**0.580**	**0.122**	**0.151**	**0.011**	**0.015**
	0.016	*0.009*	*0.020*	*0.002*	*0.003*
H5	**0.836**	**0.029**	**0.041**	**0.001**	**0.001**
	0.033	*0.004*	*0.019*	*0.001*	*0.001*
H6	**0.712**	**0.535**	**0.192**	**0.073**	**0.101**
	0.047	*0.018*	*0.035*	*0.019*	*0.025*
Within	**.**	**.**	**.**	**0.156**	**0.215**
	.	.	.	.	.
Between	**.**	**.**	**.**	**0.394**	**0.545**
	.	.	.	.	.
Overlap	**.**	**.**	**.**	**0.174**	**0.241**
	.	.	.	.	.
National Gini index	**0.724**	**1.000**	**1.000**	**0.724**	**1.000**
	0.010	*0.000*	*0.000*	*0.010*	*0.000*

[-] Standard errors are in italics.
Source: Authors' calculations using the NHIES 2003/2004 survey data and CGE model results.

Scenario 4: Taxing Mining to Subsidize Rural Households in Category 6

Table 10: Gini index Decomposition by Household Groups: Household Net Income Values under Simulation 4 (SC4)

Household Group	Gini index	Population share	Income share	Absolute contribution	Relative contribution
H!	**0.552**	**0.241**	**0.382**	**0.051**	**0.074**
	0.018	*0.014*	*0.037*	*0.007*	*0.011*
H2	**0.711**	**0.034**	**0.066**	**0.002**	**0.002**
	0.043	*0.005*	*0.021*	*0.001*	*0.001*
H3	**0.673**	**0.039**	**0.055**	**0.001**	**0.002**
	0.037	*0.004*	*0.011*	*0.000*	*0.001*
H4	**0.580**	**0.122**	**0.124**	**0.009**	**0.013**
	0.016	*0.009*	*0.017*	*0.002*	*0.003*
H5	**0.836**	**0.029**	**0.040**	**0.001**	**0.001**
	0.033	*0.004*	*0.019*	*0.001*	*0.001*
H6	**0.712**	**0.535**	**0.332**	**0.127**	**0.184**
	0.047	*0.018*	*0.050*	*0.028*	*0.038*
Within	**.**	**.**	**.**	**0.190**	**0.276**
	.	.	.	.	.
Between	**.**	**.**	**.**	**0.233**	**0.339**
	.	.	.	.	.
Overlap	**.**	**.**	**.**	**0.265**	**0.385**
	.	.	.	.	.
National Gini index	**0.688**	**1.000**	**1.000**	**0.688**	**1.000**
	0.017	*0.000*	*0.000*	*0.017*	*0.000*

[-] Standard errors are in italics.
Source: Authors' calculations using the NHIES 2003/2004 survey data and CGE model results.

4. CONCLUSIONS

The relevance of this sector in Namibian economy has led some policy makers to consider this industry as an important factor to reduce social and economic inequalities. At first glance, one could think that higher tax rates on diamonds could finance subsidies in employment and boost economic growth. However, the CGE results show that the effects of tax reforms on the mining industry, comprised mainly of diamonds and uranium, are quite limited. Our results suggest that taxes on diamonds fail to reduce Namibia's extremely high unemployment rate. The CGE model results indicate that subsidizing subsistence farming fails to substantially boost employment and rural household welfare. The numbers[8] in Table 3 clearly state that show the impact of targeting subsidies to traditional agriculture products does not generate any positive result on unemployment rates for unskilled labor. Subsidizing unskilled labour in the fishing industry seems to have more significant effects in this regard. Moreover, the mining sector also employs unskilled workers, and consequently it is not clear that raising taxes on this industry would increase employment enough to counteract the negative effects on higher taxation policies on the economy as a whole. In all simulations the effects on real GDP are negative or negligible.

5. REFERENCES

Alesina, A. and Rodrik, D. (1994). "Distributive Politics and Economic Growth," *The Quarterly Journal of Economics* 109, p. 465-90.

Ali, A. A. and Thorbecke, E. (2000). "The State and Path of Poverty in Sub-Saharan Africa: Some Preliminary Results," *Journal of African Economies* 9, Supplement 1, p. 9-40.

Araar, A., Duclos J.Y. and Makdissi, P. (2012). "Pro-poor indirect tax reforms, with an application to Mexico,"Working Papers P56, FERDI.

Fosu, A.K. (2009), "Inequality and the Impact of Growth on Poverty: Comparative Evidence for Sub-Saharan Africa", *Journal of Development Studies* 45, p. 726-745.

Fosu, A.K. (2011). "Growth, inequality, and poverty reduction in developing countries: Recent global evidence", Working paper. World Institute for Development Economics Research, No. 2011,01, ISBN 978-92-9230-364-8.

[8] In the simulations there are not direct exogenous increases in private investment but we are evaluating the effects of a more effective labour policy.

GRN (Government of the Republic of Namibia), (2004),."Namibia Vision 2030: Policy Framework for Long Term National Development", Windhoek: Office of the President.

GRN, (2014)

Humavindu, M.N. and Stage, J., (2013),"Key Sectors of the Namibian Economy", Journal of Economic Structures 2, p.1-15. DOI 10.1186/2193-2409-2-1

Kalwij, A. and Verschoor, A. (2007) "Not by growth alone: The role of the distribution of income in regional diversity in poverty reduction" *European Economic Review* 51, p. 805-829.

Lange, G.M. and Schade, K. (2009), "A Social Accounting Matrix for Namibia 2004: A tool for Analyzing Economic Growth, Income Distribution and Poverty" NEPRU Working Paper, 112. Windhoek: Namibian Economic Research Policy Unit.

Le Billon, P. (2008)."Diamond Wars? Conflict diamonds and geographies of resource wars", *Annals of the Association of American Geographers* 98, p.345-372.

Leichenko, R.M. and O'Brien, K.L. (2008). "Double exposure: Global environmental change in an era of globalization", Oxford University Press, Oxford.

Levine,R. (2011). "Regulating finance and regulators to promote growth," Proceedings - Economic Policy Symposium - Jackson Hole, Federal Reserve Bank of Kansas City, p. 271-311.

Mevel, S. and Karingi, S. (2013), "Towards a Continental Free Trade Area in Africa: a CGE Modelling Assessment with a Focus on Agriculture", in Shared Harvests: Agriculture, Trade and Employment, Cheong, D., Jansen, M. and Peters, R. (eds), International Labour Organization and United Nations, Geneva.

Mwinga, M.S. (2012), "Unemployment in Namibia: Measurement Problems, Causes and Policies", First Capital Working Paper series, Windhoek, Namibia.

OECD (2008), "African Economic Outlook: Namibia", © AfDB/OECD 2008. http://www.oecd.org/dev/emea/40578314.pdf

President. http://www.npc.gov.na/vision/pdfs/Summary.pdf (accessed 20 October 2012).

Ravillon, (2009)

Sahlén, L. and Stage, J. (2012), "Environmental fiscal Reform in Namibia: A Potential Approach to Reduce Poverty?", The Journal of Environment and Development 21, p. 219-243.

Silva, J. A. (2008). "International Trade and the Changing Demand for Skilled Workers in High-tech Manufacturing", *Growth and Change* 39, p. 225-251. doi: 10.1111/j.1468-2257.2008.00418.x.

White, H. and Masset, E. (2002). "Child poverty in Vietnam: using adult equivalence scales to estimate income-poverty for different age groups", Working Paper MPRA 6.
World Bank, The (2014)
WTTC (World Travel and Tourism Council), (2012)."Travel and Tourism Economic Impact 2012: Namibia", London: World Travel and Tourism Council. Retrieved 10 January 2014. http://www.wttc.org/site_media/uploads/downloads/namibia2012.pdf