Economy-wide Implications of Minimum Wage in Ethiopia: A Computable General Equilibrium Analysis

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Abstract
As with many government policies, minimum wage has several positive and negative economic effects. In spite of the differing effects of minimum wage legislation, its macroeconomic impact has found little interest in empirical study in Ethiopia and little do we know on how exactly the minimum wage affects macroeconomic variables. Thus, this study examines the macroeconomic effects of minimum wage in Ethiopia using A Static CGE model. For these purposes, we utilized the data of the 2005/06 SAM of EDRI, CSA, and MCS. Simulation results show that a rise in minimum wage would lead to a marginal rise in output in agriculture and service sectors as well as a significant rise in output of industry and mining sectors. The impact of minimum wage increase on household income and consumption is mixed; while it leads to rise income and consumption of rural households, there is a marginal fall in income and consumption of urban households. In terms of price effect, an increase in minimum wage would lead to a slight rise in general price level. A rise in minimum wage has also positive effects on government income and negative impact on the government expenditure. Moreover, the total welfare of households has improved as a result of adjustment in the minimum wages, suggesting the positive welfare effect of minimum wages policy.

Key Words: Minimum wage, Static CGE, Macroeconomic variables, Ethiopia.

1. INTRODUCTION
Minimum wages have been developed in New Zealand and Australia at the very end of the 19th century. It has been developed as a social protection policy based on the view that free markets fail to produce the desired outcomes in some circumstances (Belser, 2011). Its intended objectives are to prevent the exploitation of workers by employers, to promote a fair wage structure, to provide a minimum acceptable standard of living for low-paid workers and, eventually, to alleviate poverty, especially among working families (ILO, 1992).

Since its enactment, it has got substantial theoretical as well as political controversy. Proponents promote minimum wage as a means of improving incomes of low-wage workers and their families’ so-called ‘working poor’ (Rutkowski, 2003). They argue that minimum wage increases the standard of living for the working poor and removes low paying jobs, forcing workers to train for, and move to, higher paying jobs. As a result of higher wages, consumption and aggregate demand will increase, which will trigger some element of growth of the economy (Smith, 2012). Opponents argued that the minimum wage acts against the very people it is supposed to help by pricing them out of employment and thus eventually reducing rather than enhancing worker welfare. They argued that minimum wage is poorly targeted, since most low wage workers live in families with relatively high levels of income (Bernstein and Schmitt, 2000).

Given these controversies, empirical literatures have established that minimum wage policy affects several macroeconomic variables in different part of the world. Studies on the labour market in general and wage system in particular, however, have been quite limited in Ethiopia. This is particularly true of employment wage structure in the private sectors. Most of the studies conducted so far and whatever organized information available pertains to public sector. But, the government in Ethiopia has been and still is the largest employer and what happens in this sector in terms of wage and other employment policies has quite a considerable impact on the labour market. Moreover, none of the adjustment in the wage structure for public employees so far is based on systematic studies on the impact of such policies on macroeconomic variables. Hence, in order to alleviate these problems,
careful analysis of such policy on the macroeconomic variables is crucial for the well functioning of the economy in general and wage structure in particular.

Moreover, although there are ample studies that have examined the impact of minimum wage in an economy across different parts of the world, such studies have often employed a partial analysis (Adams, 1987; Folawewo, 2007). As pointed out by Adams (1987), the impact of minimum wage could only be adequately captured within a macroeconomic model framework. This study, therefore, analyze macroeconomic effects of minimum wage using a computable general equilibrium (CGE) framework. In particular, the aim of this study is to examine the impact of minimum wage policy on macroeconomic variables of interest such as household income, household consumption, general price level, sectoral output and employment, welfare and government balances using a CGE framework and accordingly to suggest certain solutions that could improve the current situation of minimum wage in Ethiopia.

The rest sections are organized as follows. The second section gives brief review of literature on the impact of minimum wage. The third section introduces the data base (SAM) and specifies the theoretical framework for the CGE. The fourth section discusses the results from the CGE models. The final section provides the concluding remarks.

2. Literature Review

In the literature, there are hundreds of studies on the effect of minimum wage on various macroeconomic variables, where only few of them are presented in this section. Brown et al. (1982) examined employment effect of the minimum wage on both teenagers and adults and found a negative relationship between minimum wage and employment. Brown et. al’s finding is similar to that of Adams (1987), who employed a macro-econometric model. He found that an increase in minimum wage would have a corresponding increasing effect on price level, while it would lead to a small negative impact on real wage, employment and real GNP.

Similarly, Neumark and Wascher (2008) estimated the minimum wage effects in 17 OECD countries for teen and youth. The results of the study suggested negative effects of the minimum wage on employment though the employment elasticity varies for short and long run. Draca et al (2005) examined price effect of reintroduction of a national minimum wage for the UK and found statistically insignificant coefficient with 0.034 using a reduced form version of the model and 0.020 using instrumental variables methods.

Burkhauser et al (2007) examined effects of minimum wage on the income distribution using simulation methods in USA. They suggested that the targeting of the 2005 minimum wage legislation may be slightly worse than in the mid-1990s because the percentage of affected workers in poor and near-poor families was lower in 2003 than in 1995 (24.2 percent versus 28.9 percent). Despite significant wage spillovers, the research on price effects of minimum wage was very scarce in developing countries. Lemos (2004) examined the impact of minimum wage on general price level in Brazil and found that a 10 percent increase in the minimum wage raises prices by 0.32 percent and 2.38 percent in the short and long run respectively.

Unlike income distributional effect of minimum wage for developed countries that found no positive distributional effects, the results are somewhat ambiguous for most developing countries in that minimum wages tend to have no effect on the poverty rate, but effects on incomes of the poor that vary by country (World Bank, 2006). Gindling and Terrell (2007) study the distributional effects of the minimum wage in Honduras using panel data set for the period (2001-2004). They estimated that minimum wages reduce the likelihood that a worker is in a poor or extremely poor family, with elasticities of 0.1 and 0.18, respectively.

The above-mentioned studies employed a partial equilibrium framework. Computable general equilibrium (CGE) approaches have also been employed to examine the economic impact of alternative labour market policies including minimum wage studies. Decaluwe et al (2000) found that the presence of a minimum nominal wage for the formal workers may reduce the gains stemming from the customs union reform. They used a multi-country and multi-sectoral computable general equilibrium model (CGE) of the Western African Economic and Monetary Union countries to assess the impact of customs union reform. David et al (2006) used static CGE model to examine 2005 increase in minimum wage and indicated that a five percent increase in minimum wage would cause 2.5 percent a loss of jobs but the wage bill for
minimum wage workers would increase by 2.38 percent of the baseline minimum wage bill and change in gross state product was about 0.007 percent. However, the impact of minimum wage on the size distribution household income is mixed. According to their results, low income households in Washington experienced an increase in welfare and there was a slight decrease in welfare for high income households.

In another study made on the economic impact of minimum wage in Nigeria, Folawewo (2007) examined macroeconomic impacts of Nigerian minimum wage on economic variables using a Static CGE model. Accordingly, he found that a rise in minimum wage would lead to increased output, general price level, household income and government balances. However, according to his finding, the impact of minimum wage increase on employment is mixed; while it leads to marginal rise of employment in agricultural sector, there is a marginal fall in services sector’s employment, and no significant effect in manufacturing and mining and oil sectors employment.

Regarding empirical evidence in Ethiopia, the study conducted on minimum wage has assessed its impact on employment for manufacturing sector and general price level using Ordinary Least Square (OLS)\(^1\). They argued that minimum wage is negatively and significantly correlated with manufacturing sector employment and positively correlated with general price level.

In sum, the above review of literature reflects that hundreds of researches have been undertaken in regard to issues on the effects of minimum wages in different parts of the world. An important issue is the methodological framework adopted so far in the literature, while some previous studies have used a simulation models, others have adopted the use of partial equilibrium and yet others have employed general equilibrium model. The literature has established that minimum wage policy has either positive or negative effects on several macroeconomic variables, but very few are said on the overall effect of a rise in minimum wage on the broader economy or the welfare of households. Thus, the analysis of its macroeconomic effects requires the use of economy-wide model (Adams, 1987; Folawewo, 2007; and David et al, 2006). Consequently, in this study, a Static Computable General Equilibrium (CGE) model is employed to track the effect of minimum wage policy of labour demand (employment), output, general prices level, household income, welfare and government balances.

3. Methodology

3.1. Data and Social Accounting Matrix (SAM)

The study used a static CGE framework to appropriately capture the economy –wide impacts of minimum wage in Ethiopia. The CGE model is numerically calibrated based on the 2005/06 Ethiopia SAM\(^2\). A SAM is an \(N\times N\) comprehensive and consistent, economy wide data framework or set of accounts that has detailed quantification for economic flows of incomes and expenditures in an economy, usually a nation, for a given period of time, mostly a year (Lofgren et al., 2002). Given a double entry accounting principle, total income (row total) must equal total expenditures (column total) for each account (Lofgren et al., 2002; Folawewo, 2007). The standard SAM employed in this study has four major accounts. These are the activities (production sector) account, the commodities account, factors (of production) account, and the institutions (households, firms, government and the ROW) account.

In this study, we used the 107×107 15 sector SAM which has 34 activities, 51 commodities, 8 factors of production (labour, land, livestock and capital), 7 institutions (an enterprise, a government, 4 households and a ROW), 3 tax accounts (direct tax, sales tax and import tax), transaction costs (total margins), stock changes\(^3\), and Saving – Investment account.

3.3. The Model

The static model used in this study is considered sufficient to track reactions to and feedback effects from the rest of the economy as a result of changes in minimum wages (Folawewo, 2007). The model used in this study is the standard CGE model developed by International Food Policy Research Institute (IFPRI) (Lofgren et al., 2002), which follows the neoclassical-structuralist modeling tradition.

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\(^1\) Addis Ababa University (AAU), 2003

\(^2\) 2005/06 Ethiopia SAM constructed by the Ethiopian Development Research Institute (EDRI, 2009) in collaboration with the Institute of Development Studies at the University of Sussex.

\(^3\) A stock change represents inventory investment by sector of origin (Lofgren et al., 2002).
originally presented in Dervis et al. (1982) with some additional features being included\(^4\). The complete static CGE model can be accessed from the author up on request.

The model consists of three distinct aggregated activity sectors within the economy; agricultural sector, industry and mining sector, and services sector. These sectors produce different goods which are either consumed domestically or exported. In the model, a representative household is assumed and four groups of household can be identified: rural poor, rural non-poor, urban poor and urban non-poor households. The goods and services available in the economy can be classified into three: domestic goods; export goods; and imports. To introduce minimum wage in the CGE model, we followed works of David et al (2006) and Folawewo (2007). Hence, in the model, since minimum wage is an extra burden to the cost of labour, it is introduced as additional cost on the price of labour. This allows for tracking the feedback effect of minimum wage policy on economic sectors and institutions (Folawewo, 2007). The standard CGE model consists of four major different blocks namely: price, production and trade, institutions and system constraint blocks.

### 3.2.1 Production and Trade Block

Production in the economy is carried out by activities that are assumed to maximize profits subject to their technology at an ongoing price and operates in a perfectly competitive environment. In this study, the technology at the top level is a Leontief function of the quantities of value added and intermediate inputs. The value-added part, aggregate intermediate input part and marketed domestic output are described by constant elasticity substitution (CES), Leontief and constant elasticity transformation (CET) functions respectively as expressed by equations (1), (2) and (3).

\[
\begin{align*}
QVA_a &= ivva_a, \quad QA_a \quad a \in ALEO \\
QINV A_a &= inta_a, \quad QA_a \quad a \in ALEO \\
QX_c &= \alpha_c^t \cdot \left( \delta_e^t \cdot QE_c^\hat{p} + (1 - \delta_e^t) \cdot QD_c^\hat{p} \right)^{1/\rho_e^t} \quad c \in (CE \cap CD) \\
\end{align*}
\]

The factor demand explains activity demand for factors based on distorted price of labour, which reflects the existence of biding minimum wage in all economic sectors.

\[
WF_a \cdot WFDIST_a = \left(1 + \theta \right)PVA_a \cdot QVA_a \cdot \left( \sum_{f \in F} \delta_{fa}^\theta \cdot QF_{fa}^{\rho_a^\theta - 1} \right)^{-1} \cdot \delta_{fa}^\theta \cdot QF_{fa}^{\rho_a^\theta - 1} 
\]

Given the imperfect transformability between domestic sales and export, the export-domestic supply ratio is expressed as:

\[
\frac{QE_c}{QO_c} = \left( \frac{PE_c}{PD_c} \cdot \frac{1 - \delta_e^t}{\delta_e^t} \right)^{\frac{1}{\rho_e^t}} \quad c \in (CE \cap CD) 
\]

The composite supply (Armington) function is specified to capture the imperfect substitutability between imports and domestic output sold domestically as a CES function.

\[
\frac{QQ_c}{QQ_c} = \alpha_c^q \cdot \left( \delta_q^q \cdot QM_c^{-\rho_q^q} + (1 - \delta_q^q) \cdot QD_c^{-\rho_q^q} \right)^{-\frac{1}{\rho_q^q}} \quad c \in (CM \cap CD) 
\]

For the Armington function, the import-domestic demand ratio is given as a function of the domestic-import price ratio.

\[
\frac{QM_c}{QQ_c} = \left( \frac{PDD_c}{PM_c} \cdot \frac{\delta_c^q}{1 - \delta_c^q} \right)^{1 + \rho_q^q} \quad c \in (CM \cap CD) 
\]

### 3.2.1 Price Block

In this block, the linkages between endogenous model prices with other endogenous or exogenous prices and non price variables are specified. As specified below, the import price, export price and price for domestically produced non-tradable goods are described by equation (8),(9) and (10).

\[
\begin{align*}
PM_c &= p\text{wm}_c \cdot (1 + tm_c) \cdot EXR + \sum_{c \in CT} PQ_c \cdot icm_c \\
PE_c &= p\text{we}_c \cdot EXR + \sum_{c \in CT} PQ_c \cdot icc_c \\
\text{PDD}_c &= \text{PDS}_c + \sum_{c \in CT} PQ_c \cdot icd_c \\
\end{align*}
\]

\(^4\) The additional features included in the IFPRI\'s standard CGE model are: household consumption of non-marketed (home) commodities, transaction costs for commodities that enter the market sphere and a separation between production activities and commodities.
We also have specifications for equations for consumer price index (CPI) and producer price index for non-traded market output (DPI). In our model, the CPI is the numeraire and hence is fixed whereas the DPI is made flexible.

\[
\begin{align*}
CPI &= \sum_{c\in E} P Q_c wtc_e \\
DPI &= \sum_{c\in E} PDS_c dwtc_e 
\end{align*}
\] (11)

3.2.3 Institutions Block

This block constitutes the modeling of the incomes and expenditures of the four major institutions: households, government, enterprises and the rest of world (ROW). Factor income (\(YF_f\)) is given by:

\[YF_f = \sum_{a\in A} WF_f WFDIST_{fa} QF_{fa} \quad f \in F\] (13)

In the model, the institutional factor income, \(YIF_{if}\) and domestic non-government institutions income, \(Y_i\) are given by equations (14) and (15).

\[
YIF_{if} = shi_{if} \cdot [YF_f - transfr_{rowf} \cdot EXR] \quad i \in INSD; f \in F
\] (14)

\[
Y_i = \sum_{f\in F} YIF_{if} + \sum_{i\in INSDNG} TRI_{ii} + \sum_{i\in INSDNG} transfr_{govf} \cdot DPI + transfr_{rowf} \cdot EXR \quad i \in INSDNG
\] (15)

Household consumption expenditure, \(EH_h\), government revenue, \(YG\), and total current government expenditure, \(EG\), are expressed by equations (16), (17), and (18).

\[
EH_h = [1 - \sum_{i\in INSDNG} shi_{ih}] (1 - MPS_h) (1 - TINS_h) Y_I_h
\quad h \in H
\] (16)

\[
YG = \sum_{i\in INSDNG} TINS_i \cdot Y_I_i + \sum_{c\in ECM} tm_c \cdot pwm_c \cdot QM_c \cdot EXR + \sum_{c\in E} t_q_c \cdot PQ_c \cdot QQ_c + \sum_{f\in F} YIF_{govf} + \sum_{i\in INSDNG} transfr_{govf} \cdot EXR
\] (17)

\[
EG = \sum_{c\in ECM} PQ_c \cdot QG_c + \sum_{i\in INSDNG} transfr_{govf} \cdot DPI \quad i \in INSDNG
\] (18)

3.2.4 Systems Constraint Block

The notion of closure rule implies equality of equations and endogenous variables which requires fixation of some variables for the model to have a solution. This study selected the model closures that are applicable to the Ethiopian economy. The first closure is the closure in the factor markets. This closure is the closure in which direct tax rates are exogenous and it is the changes in government savings that equilibrate the economy. For the external (ROW) balance, the default closure is fixed foreign savings (trade balance) and flexible real exchange rate that clears the current account of the ROW. Finally, in the S-I balance, a saving-driven closure is employed in our model in which investment adjusts to ensure equilibrium.

4. Empirical Analysis

4.2. Description of Simulations

Since we employed the static CGE framework, the empirical analysis compared the current time period with one date in the future. The simulations results are based on the assumption that labour is unemployed and mobile across sectors, land is fully employed and mobile across sectors implying that they can be employed in different activities. Capital, on the other hand, is fully employed and activity specific as its use is usually immobile across sectors in Ethiopia.

The macroeconomic closures (balances) are centered on the government balance, the external (current account) balance and the saving-investment (S-I) balance. For the government balance, we follow the closure in which direct tax rates are exogenous and it is the changes in government savings that equilibrate the economy. For the external (ROW) balance, the default closure is fixed foreign savings (trade balance) and flexible real exchange rate that clears the current account of the ROW. Finally, in the S-I balance, a saving-driven closure is employed in our model in which investment adjusts to ensure equilibrium.

To do so, we state baseline scenario followed by different simulation scenarios. Examining the differences between the each scenario and the baseline scenario allows one to isolate the impacts of minimum wage and thereby enable us to obtain clear and analytically tractable comparisons.

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5 In the basic model version CPI is fixed (exogenous variable) and functions as the numeraire, otherwise DPI may be fixed. A numeraire is vital since the model is homogenous of degree zero in prices (that is a doubling of the value of the numeraire would double all prices but leave all real quantities/real resource allocation unchanged).
Baseline simulation: This scenario is used as a reference point where the economy is evaluated at times of no policy change (that is no change in the minimum wage policy) or at times where the present policy environment is maintained. Thus, it is meant to reveal the existing levels of variables in the CGE model which serves to evaluate the benefits or negative effects from the changes in minimum wage policy.

Simulation scenarios: The simulation analysis has three alternative scenarios. The choice of these scenarios is based on the fact that since 1992 the federal government has never raised wages and salaries below or beyond these levels, in which wages and salaries have been increased by 90 percent, 60 percent and 35 percent in the year 2002, 2007 and 2011 respectively. Thus, the scenarios are:

Simulation Scenario 1(SIM1): A 35 percent increase in minimum wage  
Simulation Scenario 1(SIM1): A 60 percent increase in minimum wage  
Simulation Scenario 1(SIM1): A 90 percent increase in minimum wage

4.3 Analysis of Results
In this section, we analyze the results of the simulations. We see the effects of minimum wage in three related effects: sectoral effects, macroeconomic effects, and welfare. The analysis is based on the changes brought about by the three policy simulations.

4.3.2. Sectoral Effects of Simulation
The effect of different levels of increment in minimum wage on sectoral output, labour demand (employment) and general price level are presented in Table 4.1. In all simulation scenarios, while output in the agricultural sector, industry and mining has shown increase, there is a fall in output of service sector in the first simulation. This fall in output in service sector might be attributed to the fall in labour productivity in the sector.

A worthy of discussion is with regards to labour demand (employment). According to the simulation results, there are no changes in the demand for any type of labour despite increase in the minimum wage in all simulation scenarios. This insignificant employment effect of minimum wage increment might be credited to the fact that salaries and wages in the country are not large enough to affect labour demand (employment). According to Rutkowski (2003), if the minimum wage is set at a moderate (low) level, then it does not cause employment losses. Therefore, the result indicates low level of wages and salaries in the country, which is very low as compared to most of the developing countries and hence, explains the reason why adjustments in minimum wage in the three scenarios do not accompanied by disemployment effects as suggested by most supporters of neoclassical labour market models. This result confirms the study by (Card and Krueger, 1994; Saget, 2001 and Folawewo, 2007).

Table 4.1: Effects of Simulations on Sectoral Output and Employment

<table>
<thead>
<tr>
<th></th>
<th>Base Value (Billion Birr)</th>
<th>SIM 1</th>
<th>SIM 2</th>
<th>SIM 3</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Output</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Agriculture</td>
<td>64.98</td>
<td>0.13</td>
<td>0.08</td>
<td>0.21</td>
</tr>
<tr>
<td>Industry and Mining</td>
<td>43.22</td>
<td>14.57</td>
<td>17.09</td>
<td>57.54</td>
</tr>
<tr>
<td>Services</td>
<td>39.42</td>
<td>-0.19</td>
<td>0.49</td>
<td>0.46</td>
</tr>
<tr>
<td><strong>Labour</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Agriculture labour</td>
<td>25135813</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Unskilled Labour</td>
<td>1076617</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Skilled Labour</td>
<td>5272737</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
</tbody>
</table>

Source: Simulation Results from the CGE Model

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6 For instance, $47.16 in Nigeria, $ 96 in Zambia, and $119.4 in Tunisia (Saget, 2001)
In order to isolate the impact of minimum wage policy on prices focus is made on two types of price: prices of composite goods (PQ) and aggregate output price (PX). The average net effect of changes in minimum wage on each of the two prices across the three sectors suggest that prices of composite goods and output tend to rise with adjustments in minimum wage except in the second simulation for composite price. This indicates that increase in minimum wage would result in slightly inflationary pressure which consequently erodes the purchasing power of income. This result is in line with the results by (Adams, 1987; Card and Krueger, 1994; AAU, 2003; Lemos, 2004 and 2006; Folawewo, 2007).

Table 4.2 Effects of Minimum Wage on general price level (percentage changes)

<table>
<thead>
<tr>
<th></th>
<th>Base Value (Billion Birr)</th>
<th>SIM 1</th>
<th>SIM 2</th>
<th>SIM 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Price</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PQ</td>
<td>58.4</td>
<td>0.2</td>
<td>-0.2</td>
<td>0.7</td>
</tr>
<tr>
<td>PX</td>
<td>46.0</td>
<td>0.8</td>
<td>0.0</td>
<td>1.1</td>
</tr>
</tbody>
</table>

Source: Simulation Results from the CGE Model

4.3.2. Effects on Macroeconomic Indicators

In table 4.3, we report the simulation results of key macro indicators. The macro variables are government expenditure, government income, household consumption, and household income. The simulation results shows that the impact of minimum wage increase on government balance is as expected as the larger group of wage earners are in the public sector. The impact of minimum wage increase on the household income and expenditure is also positive except for the urban non-poor households.

However, we see negative impact of minimum wage increase on the urban non-poor households. This is attributed to the facts that, according to EDRI (2009), urban non-poor household generate smaller portion of their income from labour. As a result, they are less advantageous than those household who generate more income from labour and increase in minimum wage benefit the latter household groups, but the former household groups could not shoulder negative influence of rise general price level, implying fall in their real income. The results support the finding of David et al (2006) and Folawewo (2007).

In simulation two, the impact of minimum wage adjustment has brought about fall in the government current income while it leads to increase in the government current expenditure. However, the implications of minimum wage increase vary for rural and urban households, which has lead to two mixed effects: while it leads to a rise in the rural household income and consumption (with rural poor households benefiting more), there is fall in income and consumption of urban households. This result corporate the mixed household income effect of Neumark et al (2006).

Table 4.3: Income, Consumption and Public Sector Effects of Simulation

<table>
<thead>
<tr>
<th>Macro Variable</th>
<th>Base Value (Billion Birr)</th>
<th>SIM 1</th>
<th>SIM 2</th>
<th>SIM 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Government Current Income</td>
<td>17.5</td>
<td>-0.3</td>
<td>-0.1</td>
<td>0.0</td>
</tr>
<tr>
<td>Government Current Expenditure</td>
<td>12.1</td>
<td>1.8</td>
<td>0.1</td>
<td>2.3</td>
</tr>
<tr>
<td>Household Income</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rural Poor</td>
<td>24.8</td>
<td>1.9</td>
<td>2.1</td>
<td>3.1</td>
</tr>
<tr>
<td>Rural Non-Poor</td>
<td>73.1</td>
<td>0.6</td>
<td>0.8</td>
<td>2.9</td>
</tr>
<tr>
<td>Urban Poor</td>
<td>5.0</td>
<td>0.7</td>
<td>-0.9</td>
<td>-0.2</td>
</tr>
<tr>
<td>Urban Non-Poor</td>
<td>30.0</td>
<td>-0.2</td>
<td>-0.15</td>
<td>0.2</td>
</tr>
<tr>
<td>Household Consumption</td>
<td>Rural Poor</td>
<td>Rural Non-Poor</td>
<td>Urban Poor</td>
<td>Urban Non-Poor</td>
</tr>
<tr>
<td>-----------------------</td>
<td>-----------</td>
<td>----------------</td>
<td>-----------</td>
<td>----------------</td>
</tr>
<tr>
<td>Rural Poor</td>
<td>21.1</td>
<td>0.9</td>
<td>1.2</td>
<td>1.3</td>
</tr>
<tr>
<td>Rural Non-Poor</td>
<td>65.7</td>
<td>0.5</td>
<td>0.18</td>
<td>1.9</td>
</tr>
<tr>
<td>Urban Poor</td>
<td>4.3</td>
<td>0.6</td>
<td>-0.9</td>
<td>-0.2</td>
</tr>
<tr>
<td>Urban Non-Poor</td>
<td>23.7</td>
<td>-0.1</td>
<td>-0.5</td>
<td>0.1</td>
</tr>
</tbody>
</table>

Source: Simulation Results from the CGE Model

In the last simulation, unlike the first and second simulations, a rise in minimum wage made the government income remain unchanged. The results suggest that although increase in public sector wages and salaries would raise government expenditure, it would not result into decline in government revenue, which might be due to the facts that increase in the government expenditure due to increase in minimum wages has been neutralized by increase in different types of tax and non-tax revenues. This result is in line with the results of Folawewo (2007). By the same token, similar rise in minimum wage brought about increase in consumption and income of all household types in rural and urban areas except the urban poor households.

4.2.3 Welfare Effects of Simulation

Minimum wage policy enhances factor returns which in turn increases households’ income. Though overall distributional impacts of minimum wage are positive and similar across household groups, different minimum wage scenarios have varying effect on household groups, which can be shown in the following figure 4.1. Welfare effects of a given policy can be measured using different measures. But, most widely used measure of welfare in the literature is Equivalent Variation (EV).

In the first simulation, increases in minimum wage positively affected both the urban and rural households as the positive values for EVs would suggest. When we compare poor and non-poor households, the EVs indicate that the poor households received much of the welfare gain in both rural and urban areas. This may indicates that minimum wage adjustments have positively affected poor household groups, while improving their livelihoods upwards. Comparing urban and rural households, we find that rural households benefited a lot from such compensation policy in terms of increased minimum wages. This may be due to the fact that majority of minimum wage workers found in the rural areas and they are poor. Hence, such households are more likely affected by minimum wage increases than non poor households.

Figure 4.1: Welfare Effects of the Policy Shocks

Source: Simulation Results from the CGE Model

In the second and third simulations, we see positive EVs for the increases in minimum wage indicating welfare improvements too. However, the welfare of urban poor is negatively affected by increase in minimum wage. The welfare of rural households improved larger than that of the urban counterparts.
The outcomes seem to favour the rural poor and to suggest that the rural poor will need to be targeted in such programs whereas the urban poor may not get the benefits expected from such increase in minimum wages as an incentive.

Finally, the simulation results depicted in figure 4.1 also show total welfare changes for households in each simulation. The total welfare has improved in all simulations though magnitude differs, supporting the view that increases in minimum wage is pro-poor provided that it is well designed based on the empirical studies on its impacts. This result is similar to the conclusion obtained by Folawewo (2007) and David et al (2006).

5. Concluding Remarks

The minimum wage policy is regarded as major means of boosting welfare in many countries, especially in developing countries. Even though continuous adjustment in wages might have both positive and negative impacts on Ethiopian economy, government regarded such increment as an income policy without empirical analysis in the area. This paper employed a Static General Equilibrium Approach to examine the macroeconomic impact of increases in minimum wage on the Ethiopian economy. To this end, 2005/06 Ethiopian SAM is used.

Simulation results from the study show that a rise in minimum wage would lead to rise in output in agriculture, industry and mining sectors while there is marginal fall in output in service sectors. Similarly, the response of demand for labour (employment) remains constant (unchanged) due to inability of existing minimum wage adjustment to affect demand for all type of labour under consideration and thereby magnifying low level of existing minimum wages and salaries in the country.

The results also reveal that an increase in minimum wage would lead to a rise in general price level, thereby, indicating that such policy could slightly induce inflation in the economy. The impact of minimum wage adjustment on employment and general price level supports the argument that if employers do not respond to changes in the minimum wage by reducing employment, they respond by raising prices. The changes in government income and expenditure due to increase in minimum wage adjustment are as expected as government employees constitute largest group of wage earners, indicating increase and decrease in government current expenditure and government current income respectively.

Furthermore, a rise in minimum wage has positive effect on rural household income and consumption, while it leads to fall in income and consumption of urban non-poor household due to the fact that labour income is not major source of urban non-poor households. Finally, total welfare of both rural and urban households has improved over the three simulation scenarios with rural poor households having more improved welfare than other household groups in all simulations, suggesting the positive welfare effect of minimum wages policy.

List of Acronyms

AAU - Addis Ababa University
CES – Constant Elasticity of Substitution
CET – Constant Elasticity of Transformation
CGE – Computable General Equilibrium
CPI – Consumer Price Index
CSA – Central Statistical Agency
EDRI - Ethiopian Development Research Institute
EEA – Ethiopian Economics Association
EV – Equivalent Variation
GAMS - General Algebraic Modeling Systems
IFPRI – International Food Policy Research Institute
ILO- International Labour Organization
MCS- Ministry of Civil Services
OLS – Ordinary Least Square
RH – Representative Households
Appendix A:
Sets, Parameters and Variables in the model

Sets
\[ CA = \pi r^2 \]
- \( a \in A \) – activities
- \( a \in ALEO (\subset A) \) – activities with a Leontief function at the top of the technology nest
- \( c \in C \) – commodities
- \( c \in CD (\subset C) \) – commodities with domestic sales of domestic output
- \( c \in CDN (\subset C) \) – commodities not in CD
- \( c \in CE (\subset C) \) – exported commodities
- \( c \in CEN (\subset C) \) – commodities not in CD
- \( c \in CM (\subset C) \) – imported commodities
- \( c \in CMN (\subset C) \) – commodities not in CM
- \( c \in CT (\subset C) \) – transactions service commodities
- \( c \in CX (\subset C) \) – commodities with domestic production
- \( f \in F \) – factors
- \( i \in INS (\subset INS) \) – domestic institutions
- \( i \in INSD (\subset INS) \) – domestic nongovernmental institutions
- \( h \in H (\subset INSNG) \) – households

Parameters (Latin Letters)
- \( cwtc \) – weight of commodity \( c \) in the CPI
- \( dwtc \) – weight of commodity \( c \) in the producer price index
- \( ica_a \) – quantity of \( c \) as intermediate input per unit of activity \( a \)
- \( icd_{c,c'} \) – quantity of commodity \( c \) as trade input per unit of \( c' \) produced and sold domestically
- \( ice_{c,c'} \) – quantity of commodity \( c \) as trade input per exported unit of \( c' \)
- \( icm_{c,c'} \) – quantity of commodity \( c \) as trade input per imported unit of \( c' \)
- \( int \) \( a_a \) – quantity of aggregate intermediate input per activity unit
- \( inv_a \) – quantity of value-added per activity unit
- \( mps_i \) – base savings rate for domestic institution \( i \)
- \( mps01_i \) – 0-1 parameter with 1 for institutions with potentially flexed direct tax rates
- \( pwe_c \) – export price (foreign currency)
- \( pwm_c \) – import price (foreign currency)
- \( qdstc \) – quantity of stock change
- \( qy_c \) – Base-year quantity of government demand
- \( qinv_i \) – base-year quantity of private investment demand
- \( shi_{if} \) – share for domestic institution \( i \) in income of factor \( f \)
- \( shii_{ii} \) – share of net income of \( i' \) to \( i \) (\( i' \in INSNG' \); \( i \in INSNG \))
- \( tins_i \) – exogenous direct tax rate for domestic institution \( i \)
- \( tins01_i \) – 0 1 parameter with 1 for institutions with potentially flexed direct tax rates
- \( tm_c \) – import tariff rate
- \( tq_c \) – rate of sales tax
- \( transfr_{if} \) – transfer from factor \( f \) to institution \( i \)

Parameters (Greek Letters)
- \( \alpha_{va} \) – Efficiency parameter in the CES value-added function
\( \alpha_{ac} \) – shift parameter for domestic commodity aggregation function

\( \alpha_c^q \) – Armington function shift parameter

\( \alpha_c^t \) – CET function shift parameter

\( \beta_{ach} \) – marginal share of consumption spending on home commodity \( c \) from activity \( a \) for household \( h \)

\( \beta_{ch}^m \) – marginal share of consumption spending on marketed commodity \( c \) for household \( h \)

\( \delta_{ac}^p \) – share parameter for domestic commodity aggregation function

\( \delta_c^q \) – Armington function share parameter

\( \delta_c^t \) – CET function share parameter

\( \delta_f^va \) – CES value-added function share parameter for factor \( f \) in activity \( a \)

\( \gamma_{ch}^m \) – subsistence consumption of marketed commodity \( c \) for household \( h \)

\( \gamma_{ach}^h \) – subsistence consumption of home commodity \( c \) from activity \( a \) for household \( h \)

\( \theta_{ac} \) – yield of output \( c \) per unit of activity \( a \)

\( \theta \) – percentage change in minimum wage

\( \rho_{a}^va \) – CES value-added function exponent

\( \rho_{ac} \) – domestic commodity aggregation function exponent

\( \rho_q^f \) – Armington function exponent

\( \rho_c^t \) – CET function exponent

**Exogenous Variables**

\( \overline{DPI} \) – producer price index for domestically marketed output

\( MW \) – Minimum Wage

\( DTINS \) – change in domestic institution tax share \((=0 \text{ for base; exogenous variable})\)

\( FSAV \) – foreign saving (FCU)

\( GADJ \) – government consumption adjustment factor

\( IADJ \) – investment adjustment factor

\( MPSADJ \) – savings rate scaling factor \((=0 \text{ for base})\)

\( QFS_f \) – quantity supplied of factor

\( TINSADJ \) – direct tax scaling factor \((=0 \text{ for base; exogenous variable})\)

\( WFDIST_{fa} \) – wage distortion factor for factor \( f \) in activity \( a \)

**Endogenous Variables**

\( CPI \) – consumer price index

\( DMPS \) – change in domestic institution savings rates \((=0 \text{ for base; exogenous variable})\)

\( EG \) – government expenditure

\( EH_h \) – consumption spending for household

\( EXR \) – exchange rate (LCU per unit of FCU)

\( GOVSHR \) – government consumption share in nominal absorption

\( GSAV \) – government savings

\( INVSHR \) – investment share in nominal absorption

\( MPS_i \) – marginal propensity to save for domestic non-government institution
\( PA_a \) – activity price (unit gross revenue)
\( PDD_c \) – demand price for commodity produced and sold domestically
\( PDS_c \) – supply price for commodity produced and sold domestically
\( PE_c \) – export price (domestic currency)
\( PINTA_a \) – aggregate intermediate input price for activity \( a \)
\( PM_c \) – import price (domestic currency)
\( PQ_c \) – composite commodity price
\( PVA_a \) – value-added price (factor income per unit of activity)
\( PX_c \) – aggregate producer price for commodity
\( PXAC_{ac} \) – producer price of commodity \( c \) for activity \( a \)
\( QA_a \) – quantity (level) of activity
\( QD_c \) – quantity sold domestically of domestic output
\( QE_c \) – quantity of exports
\( QF_{fa} \) – quantity demanded of factor \( f \) from activity \( a \)
\( QG_c \) – government consumption demand for commodity \( c \)
\( QH_{ch} \) – quantity consumed of commodity \( c \) by household \( h \)
\( QHA_{ach} \) – quantity of household home consumption of commodity \( c \) from activity \( a \) for household \( h \)
\( QINTA_a \) – quantity of aggregate intermediate input
\( QINT_{ca} \) – quantity of commodity \( c \) as intermediate input to activity \( a \)
\( QINV_{c} \) – quantity of investment demand for commodity \( c \)
\( QM_c \) – quantity of imports of commodity \( c \)
\( QQ_c \) – quantity of goods supplied to domestic market (composite supply)
\( QT_c \) – quantity of commodity demanded as trade input
\( QVA_{a} \) – quantity of (aggregate) value-added
\( QX_c \) – aggregated marketed quantity of domestic output of commodity \( c \)
\( QXAC_{ac} \) – quantity of marketed output of commodity \( c \) from activity \( a \)
\( TABS \) – total nominal absorption
\( TINS_i \) – direct tax rate for institution \( i \) \((i \in \text{INSDNG})\)
\( TRII_{it'} \) – transfers from institution \( i' \) to \( i \) (both in the set \( \text{INSDNG} \))
\( WF_f \) – average price of factor \( f \)
\( YF_f \) – income of factor \( f \)
\( YG \) – government revenue
\( YI_i \) – income of domestic nongovernment institution
\( YIF_{if} \) – income to domestic institution \( i \) from factor \( f \)