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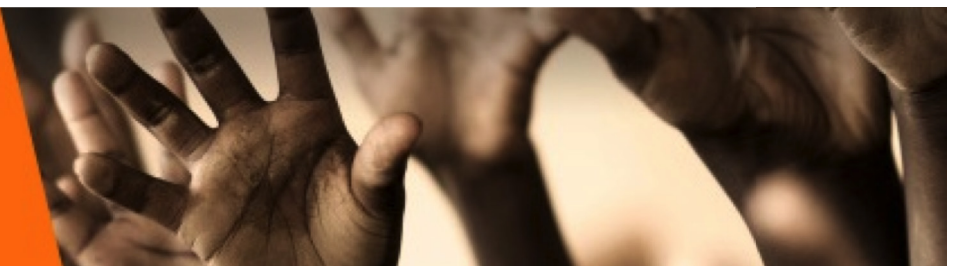
Can a Wage Subsidy Be Used to Improve Women's Formal Employment in Zambia

Bupe Simuchimba
Frank Chansa
Charles Banda
Wapakulukwela Simuchimba
Lulit Mitik Beyene

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Can a Wage Subsidy Be Used to Improve Women's Formal Employment in Zambia?

Abstract

The number of women employed in the Zambian formal sector is small, which has likely played a role in the low level of women's empowerment in the country. As a result, the government of Zambia is willing to adopt policies that can positively contribute to women's formal employment. Based on this policy objective, we propose a wage-subsidy program that considers the best design in implementation and financing. To achieve our research objectives, we calibrated a Computable General Equilibrium (CGE) methodology to a gendered Social Accounting Matrix (SAM) that disaggregated labour into skills and type of employment. Our findings suggest that a wage-subsidy program that targeted women would increase their participation in the formal sector, potentially leading to an increase in household income as well as in women's contribution to this income. Under our simulations, government revenue fell slightly when an appropriate financing option was applied, but potential benefits to the empowerment of women ultimately outweigh costs. Alternatively, to ensure that the most is obtained from a wage subsidy, corporate taxes could be raised to finance this program. The overall effect of this option would be an improvement in the performance of the economy as well as in household welfare.

JEL: C68 J16, J22, J38.

Keywords: Computable General Equilibrium, Women, Participation, Wage subsidy.

Authors

Dr. Bupe Simuchimba

Lecturer, Mulungushi University
Kabwe, Zambia
bupesimuchimba@yahoo.co.uk

Dr. Frank Chansa

Economist, Bank of Zambia
Lusaka, Zambia
Frank.chansa@gmail.com

Charles Banda

Lecturer, The University of Zambia
Lusaka, Zambia
charlesmbanda@yahoo.com

Wapakulukwela Simuchimba

Customs Officer, Zambia Revenue Authority
Lusaka, Zambia
Wap6sim@yahoo.com

Dr. Lulit Mitik Beyene

Researcher, Partnership for Economic Policy (PEP)
Addis Ababa, Ethiopia
Lulit.mitik@gmail.com

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List of abbreviations

7NDP	Seventh National Development Plan
CSO	Central Statistics Office
CGE	Computable General Equilibrium
GDP	Gross Domestic Product
ILO	International Labour Organisation
LFS	Labour Force Survey
MNDP	Ministry of National Development Planning
OECD	Organisation of Economic Cooperation and Development
SAM	Social Accounting Matrix
SUT	Supply and Use Tables
UNCTAD	United Nations Conference on Trade and Development
VAT	Value Added Tax

Executive summary

It is not necessary to write this executive summary in the first stages of research, but it may be useful to do. Motivated by the need to address the low level of women's formal-sector employment, we proposed a strategy, in line with the government's objectives as outlined in the Seventh National Development Plan (hereafter, 7NDP), by which policy makers could improve women's participation in formal employment. The 7NDP outlined objectives and strategies for the 2017-2021 period in each sector of the economy (Ministry of National Development Planning, 2017). In terms of policies that affect women, the plan's objective was to empower women in the economy, understanding that women's one strategy for doing so was to increase women's participation in formal-sector employment. Various strategies have been suggested to achieve this end, ranging from job creation to policies that encourage women to undergo training and attain higher levels of education (Ministry of National Development Planning, 2017).

The 7NDP contained no strategy related to a wage subsidy for women; in fact, no such policy has ever been offered. Instead, current strategies encourage businesses or institutions to employ or consider employing a reasonable number of women but the choice of whom to employ is left to the preferences and priorities of the business or institution.

According to the 2014 Labour Force Survey (hereafter, LFS), 71.4% of the total number of individuals employed in the formal sector were men, and only 28.6% were women. Conversely, the breakdown of the total number of individuals employed in the informal sector was 43% men and 57% women (Central Statistics Office, 2015). These statistics highlight the clustering of women in a sector that offers lower wages, no entitlements, and no social securities.

Various factors have contributed to the larger percentage of women in the informal sector, including social norms, the structure of the economy, and women's level of educational attainment. Women were mostly employed in private businesses or farm-related institutions with 53.7% while men were 46.3% of those employed in these sectors (Central Statistics Office, 2015). Most of these jobs were in line with the perceived role of women. Employers would rather employ women in these sectors because, to the extent

that some aspects of these jobs were part of a “woman’s role” in society, women were perceived to need little training. Women may also decide to work in these jobs because they have poor bargaining power or were unable to get better jobs even in the formal sector (United Nations Conference on Trade and Development, 2017). Arguably, the poor quality of the jobs might eventually force women out of the formal sector and into the informal sector. This increases the vulnerability of women and reduces their empowerment.

The Zambian government has recognized the need to increase women’s participation in the formal sector and has set an objective of increasing the current level of 28.6% to 45% by 2030. Despite this positive initiative, more needs to be done if women’s formal-sector participation is to become a means to empower women. A wage subsidy, through which the government subsidizes women’s wages by paying a percentage of them, can encourage firms in the formal sector to employ women. Women would be able to obtain on-the-job training that will allow them to be competitive in the labour market especially as new jobs are being created. Such a plan requires careful design, however. If such programs are to be effective, wage subsidies must be focused on sectors intensive in women workers.

To capture the economy wide effect of a wage subsidy, we adopted a methodology that took into account inter-linkages in the economy. In addition, we used a database that captured the structure of the economy, disaggregating labour by gender, skills, and formality. Our research also offers financing options for implementing the wage subsidy, a major concern for policy makers.

Our findings suggest that a wage-subsidy program that targets women will increase their participation in the formal sector. However, this was not without some costs. Government revenue would fall slightly because the wage subsidy will need to be financed. In addition, financing options could lead to an increase in taxes paid by firms and households and in the form of indirect taxes. Despite the costs, the wage subsidy also has benefits for the economy as a whole. Such a plan could lead to an increase in household income as women earn higher incomes in the formal sector, and it could reduce labour costs because most women’s wages in the formal sector would be subsidized by the government. The ultimate result could be an increase in production, especially for labour-

intensive sectors. The overall effect on the economy would be a slight improvement in most macroeconomic variables as well as in household welfare.

I. Introduction

1.1 Context of the Study

For the 2017-2021 period, the Zambian government, through the Seventh National Development Plan (hereafter, 7NDP), its development road map, has aimed to design and adopt policies that increase the participation rate of women in the formal sector and, thus, their empowerment. Among the policies outlined in this plan, one focuses on implementing employment-creating interventions that will reduce informality and improve both working conditions and returns to labour (Ministry of National Development Planning, 2017).

So far, the 7NDP's proposed strategies for women's empowerment have included job creation (especially in the tourism and manufacturing sectors), mainstreaming of gender in public institutions and increasing the number of women who receive training and reach higher levels of education (Ministry of National Development Planning, 2017). In addition to these policies, we also explored options that might increase the chances of women entering the formal sector, especially as new jobs were being created, ultimately reducing the placement of women in the informal sector.

To improve the chances of women entering the formal sector, we focused on a wage subsidy centred on women—in other words, a government subsidy of wages paid to women employed in the formal sector. The wage-subsidy program would be expected to have two possible positive effects, depending on design and implementation. It could potentially increase the participation of women in the formal sector as well as improve their employability and competitiveness in the labour market in the long term (Almeida, Orr, and Robalino, 2014).

The wage-subsidy program was expected to improve the well-being of women—

especially of those who had been forced into the informal sector but possessed the skills necessary for work in the formal sector. This expectation was based on wage-subsidy programs which, though they have not targeted women, have improved the well-being of their intended targets by increasing their chances of being employed and earning an income (Pauw, 2003; Pauw, and Edwards, 2006; Burns, Edwards, and Pauw, 2010; Levinsohn, and Pugatch, 2014).

1.2 The Zambian Labour Market

In most developing countries, the formal sector is small while the informal sector is large (Fields, 2011; Frölich, and Haile, 2011). Women in developing countries are generally employed in the informal sector or in jobs in which earnings were relatively low (Fields, 2011). This was no different from the labour market scenario in Zambia, where 16.1% of the total employed persons were in the formal sector while 83.9% were in the informal sector (Central Statistics Office, 2015). The breakdown by gender in the formal sector shows that 71.4% are men and only 28.6% are women. In the informal sector, 43% were men and 57% were women (Central Statistics Office, 2015). Undeniably, the absorption of women into the formal sector has been slow because of factors that include economic, culture, and women's job skills.

Another possible explanation for the low number of women in the formal sector is related to the policies that have been implemented. The situation in developing countries is compounded by policies such as inflation-reduction that usually affect employment negatively and cause more women than men to face job losses (United Nations, 2014). The United Nations survey (2014) also pointed out that, when governments reduce the public sector, women were particularly disadvantaged: the majority of people want to work in the formal sector because of its better earnings, better working conditions, and social protection, and women were consequently pushed into the informal sector or unpaid care. Table 1.1 shows the percent distribution of employed persons by institution and by gender.

Table 1.1: Percent distribution of employed persons according to institution and by gender

Institutional sector	Men (%)	Women (%)
Central government	62.0	38.0
Local government	80.4	19.6
Parastatal/state-owned firms	77.1	22.9
Embassies/international organizations	82.6	17.4
Private households	47.3	52.7
Producers' cooperatives	82.4	17.6
Non-government and faith-based organizations	52.7	47.3
Private businesses/farms	46.3	53.7

Source: 2014 Labour Force Survey (Central Statistics Office, 2015).

Table 1.1 shows that women were largely segregated in private-sector jobs while men were segregated in international organizations, producers' cooperatives, and local government. These institutions employed the highest percentage of men and the lowest percentage of women in the country.

Another possible factor that may contribute to the low levels of women in the formal sector was the structure of the economy. The economic growth experienced in the Zambian economy was usually attributed to sectors such as the mining, construction, manufacturing, and agriculture (Ministry of National Development Planning, 2017). Apart from the agriculture sector, the other sectors mainly employ men because they are capital-intensive and require high levels of skill. The formal sector usually pay well and offers benefits that were essential to women. Women, however, were perceived to be more suitable for labour-intensive, low skilled jobs or for those where high turnover was common (United Nations Conference on Trade and Development, 2017). Of the few women employed in the formal sector, a higher percentage worked in sectors that were more related to perceptions of women as caregivers as shown in Table 1.1.

From a demand-side argument, private businesses and households may employ women because they lack the bargaining power to demand their true wage or better conditions of service. Private businesses benefitted from reduced labour costs. Further, the type of jobs women perform may be more in line with the caring nature of women or their perceived role based on cultural and social norms. These norms were influenced by the view that women were less suited for paid work as a result of their responsibility for unpaid

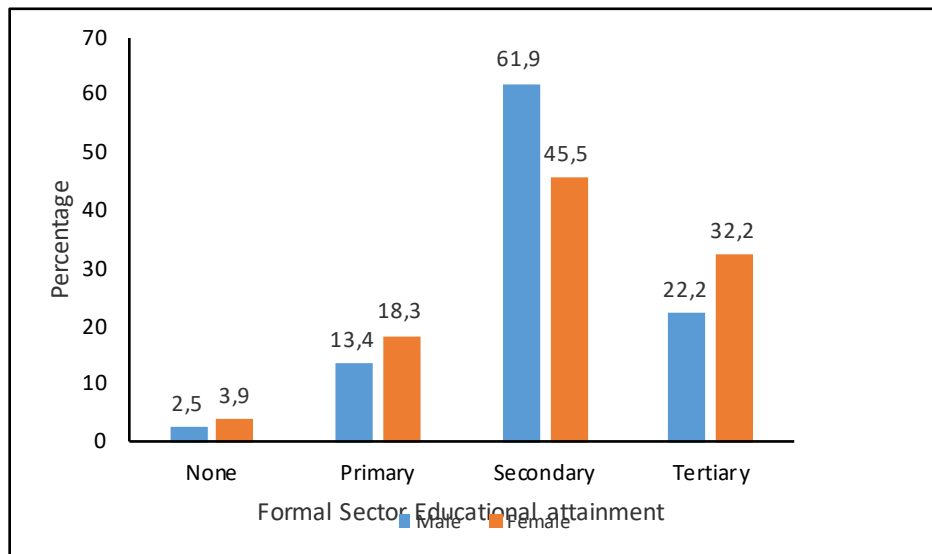
care work or their perceived lower skills (United Nations Conference on Trade and Development, 2017), and they keep women out of the formal sector.. From the supply side, however, women may not possess the skills necessary or perceived to be required for employment in these areas.

The huge gap between men and women's presence in the formal sector can also be attributed to the fact that women were more likely to use the benefits or entitlements such as leave days offered by institutions, which increases labour costs. Given their role as caregivers in households, women were more likely to stay away from work that would affect an institution especially if the institution has invested in their on-the-job training. According to the 2014 LFS of total employed, men worked, on average, more hours than women (43.4 hours and 37.2 hours per week, respectively) (Central Statistics Office, 2015).

Ironically, women who were more likely to require paid leave were concentrated in jobs that do not offer these conditions. Arguably, women may prefer to work in the informal sector because such work gives them more flexibility in fulfilling their role in the care economy. This may push women to work in the agriculture sector, despite the poor wage, because agricultural work may have other benefits (e.g., allowing women to work with their children or produce food that can be used to feed their households).

Interestingly, a closer look at the level of education of workers in the formal sector shows that most formally employed women have a tertiary education compared to men who mostly have a secondary education. Figure 1.1 shows the educational attainment of workers employed in the formal sector.

Figure 1.1: Educational attainment of employees in the formal sector

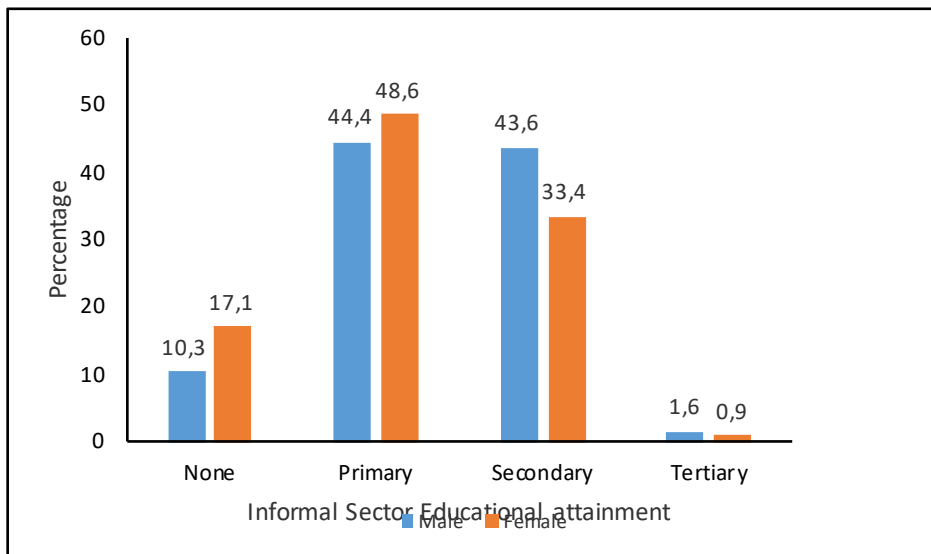


Source: 2014 Labour Force Survey (Central Statistics Office, 2015).

Figure 1.1 shows that, of the men employed in the formal sector, 61.9% had a secondary education while 22.2% had a tertiary education. Of the women employed in the formal sector, 45.5% had a secondary education while 32.2% had a tertiary education. However, these women were part of the small number working in the formal sector. In terms of formality within a given gender, 94.6% of the total number of women worked in informal employment while only 5.4% did. As for the total number of employed men, 83.4% had informal employment while 16.6% had formal employment (Central Statistics Office, 2015).

Meanwhile, the case in the informal sector was slightly different as shown in figure 1.2. Both men and women employed in the informal sector had mostly primary education.

Figure 1.2: Educational attainment of employees in the informal sector

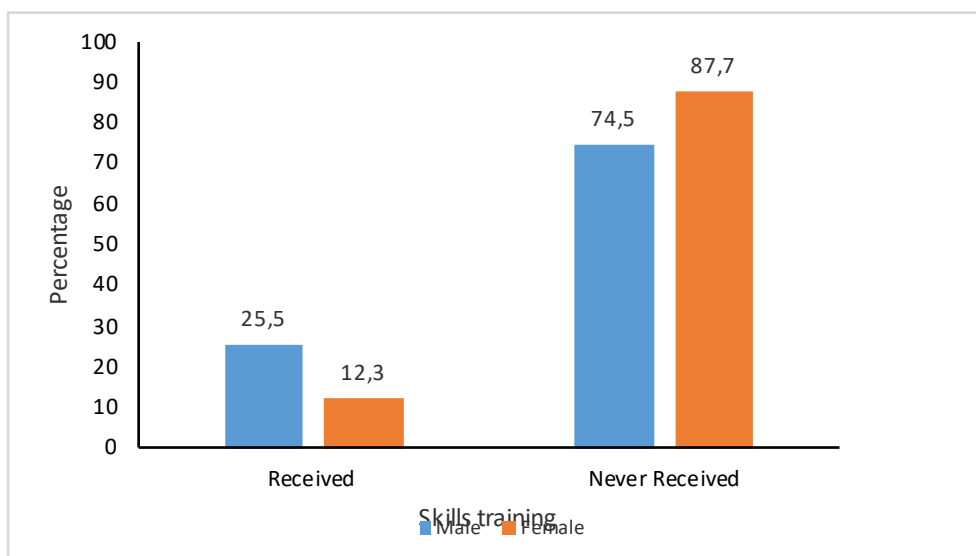


Source: 2014 Labour Force Survey (Central Statistics Office, 2015).

Figure 1.2 shows that, of men employed in the informal sector, in 2014 43.6% had secondary education while 44.4% had a primary education (as compared to women: 33.4% and 48.6%, respectively). The educational attainment of employed persons highlighted the weak educational attainment of workers in the Zambian economy.

A look at the skills training received by the employed persons revealed no improvement in this situation. As shown in Figure 1.3, most people employed in the Zambian economy had received no skills training.

Figure 1.3: Percent distribution of skills training of employed people

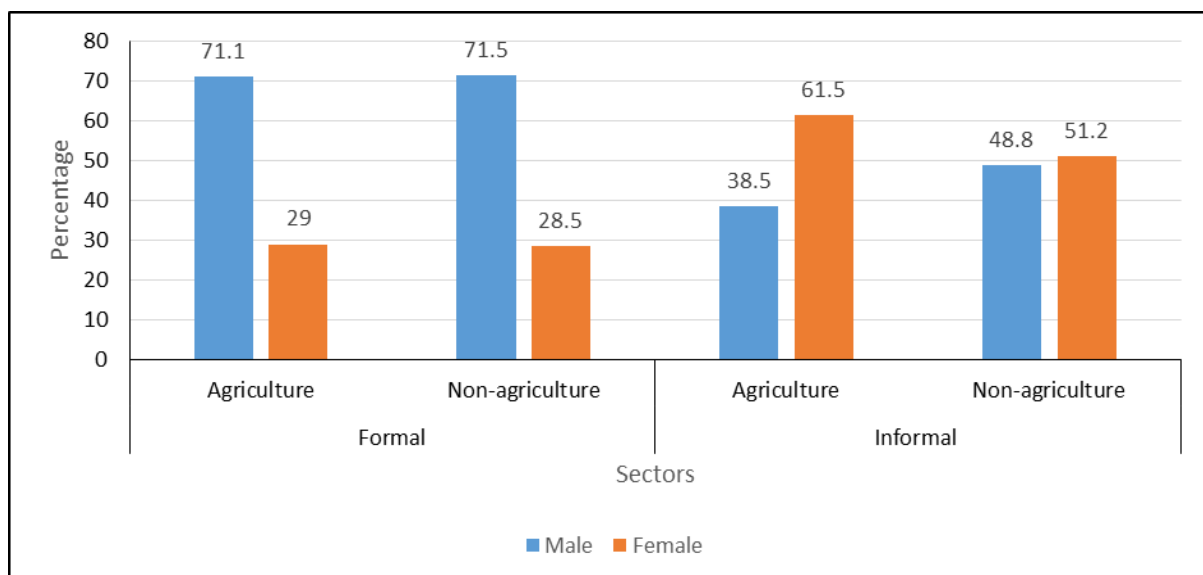


Source: 2014 Labour Force Survey (Central Statistics Office, 2015).

Figure 1.3 shows that of the women employed, 87.7% had never received any skills training while only 12.3% had received some form of skills training. The situation for men was slightly better compared to women. Of the men employed, 74.5% had never received any skills training while only 25.5% had received some form of skills training. Arguably, this shows that most employed people obtain the necessary skills as they work especially given that most work in the informal sector.

In South Asia and sub-Saharan Africa, a large proportion of women (70% and 60% respectively) were employed in the agriculture sector (Fields, 2011; Frölich, and Haile, 2011; Fox, 2015). Based on the 2014 LFS, 63.5% of all employed women in Zambia were contributing family workers compared to the 32.2% of men. Most of these workers did not get paid or had limited or no social security. Figure 1.4 shows a gender disaggregation of the formal and informal sectors by agriculture and non-agricultural activities.

Figure 1.4: Gender disaggregation of employed people in agricultural and non-agricultural activities



Source: 2014 Labour Force Survey (Central Statistics Office, 2015).

Figure 1.4 shows that of all those employed in informal-sector agriculture in 2014, 61.5% were women and 38.5% were men. Meanwhile, the formal sector was dominated by men in both agricultural and non-agricultural activities. Of the total employed in the formal agricultural sector, 71% were men and only 29% were women. Of the total employed in formal non-agricultural activities, 71.5% were men versus only 28.5% who were women.

1.3 Wage Subsidy: Design, Target, and Complimentary Policies

This section aims to explain what a wage subsidy is and how developing countries implementing similar programs have designed them. Further, the section highlighted the possible complimentary policies that can be implemented based on the factors highlighted in section 1.2 as affecting women's participation in the formal sector. Under the strategies outlined in the 7NDP plan (Ministry of National Development Planning, 2017), there was nothing related to a wage subsidy focusing on women. This was because this policy has not been offered before as an alternative to improving women's employment in the formal sector. The current strategies only encourage institutions to employ a reasonable number of women or to consider employing a considerable number of women in their institutions but this depends on the preferences and priorities of the institutions.

A wage subsidy is not a new phenomenon in Africa. It has been implemented in South Africa and Democratic Republic of Congo. In South Africa, various studies (Pauw, 2003; Pauw, and Edwards, 2006; Burns, Edwards, and Pauw, 2010; Levinsohn, and Pugatch, 2014) have considered the effect of wage subsidies aimed at increasing employment for various targeted groups. These studies had the advantage of analysing subsidy programs that were already in effect. However, they have offered valuable insight in terms of the challenges experienced as well as the ability of the wage-subsidy program to achieve its objective.

Burns, Edwards, and Pauw (2010), Pauw (2003), and Pauw and Edwards (2006) suggested that financing of the wage subsidy implemented in South Africa was a challenge. Based on this, we also offer financing options because policy makers are interested in how such a policy can be financed. Despite the financing challenges, the objectives of these wage-subsidy programs (i.e., to increase the employment of the targeted group) were met. Consequently, the intended targets benefited from the programs through improved incomes and better jobs.

One of the major concerns in this research was how to implement the wage subsidy. A wage subsidy can be implemented through government subsidies of the wages paid by the firm without lowering the wages received by worker (Pauw & Edwards, 2006). This can be in form of a direct cash subsidy or a tax credit towards future obligations. This subsidy

can be financed through an increase in income and profit tax or through a deficit financing method. Arguably, such financing methods would affect households and firms to some extent. Despite this, it was hoped that the benefits would outweigh the costs.

It is hoped that a wage subsidy targeting women will empower women by giving them an opportunity to earn a better salary and work under improved conditions in the formal sector. Such a subsidy could also improve their future chances in the labour market through the confidence, skills and training, they acquired as employees in the formal sector. In this regard, targeted women should receive both long- and short-term benefits from the program, including such short-term benefits as confidence, on-the-job on training, and experience. The wage subsidy was also intended to motivate companies to hire women and to overcome the preference for hiring men (World Bank, 2012). As such, the targeted group would be women actively seeking employment who had acquired skills that allowed them to participate in the formal sector.

Based on the structure of the Zambian labour market, issues that need to be considered in increasing women's participation in the formal sector include support to families with young children, in particular in the form of parental leave and childcare subsidies. Delivering such services directly or providing financial support to help families acquire such services in the marketplace could make it easier for women to work by reducing their double burden and lowering the opportunity cost of working. Because long-term career choices are made as soon as graduates enter the labour market, women are sorted into informal jobs with less long-term capital investment, leading to permanent divergence between men and women's labour-market outcomes and well-being (International Labour Organisation, 2010).

Greater support from the government may also ease the trade-off between having children and working outside the home, especially in the formal sector. Careful consideration should thus be given to promoting more flexible work arrangements and new cultural models that would allow a more equitable distribution of the burden of household production, including care-taking, among men and women (International Labour Organisation, 2015).

The adoption and implementation of any wage subsidy implies challenges, including

the possibility that unsubsidized workers would be replaced by subsidized workers. At the same time, employers may accept workers they would have hired even without the subsidy or may not be aware of what a wage subsidy is, potentially reducing take-up. In designing the wage subsidy, there is need to address the stigma that may be attached to the subsidy in defining high-risk groups. These challenges can be addressed by ensuring the program is well advertised and that the subsidy was simple to use in order to avoid low take-up rates (Robertson, n.d). Combining the subsidy with job training would also increase participants' future prospects.

1.4 Research Questions and Objectives

The main objective of this research was to analyse the effect of a wage-subsidy program in increasing the number of women employed in the formal sector in Zambia. To propose the best wage-subsidy program, this research considers the following questions:

- What is the best possible design of the wage-subsidy program?
- How can targeted women benefit from implementation of the program?
- What will the economy-wide effect be of adopting the wage-subsidy program?
- Do other policies exist that can increase the number of women in the formal sector?

We carried out our analyses using a methodology that captured how the adoption of the wage-subsidy program would be transmitted throughout the economy. We considered the effect of the program on various macroeconomic variables, sectors, and households and examined various designs of the wage-subsidy program by means of simulations. Finally, our research offers policy makers alternatives for implementing such a program and discusses the possible effects of these various ways.

II. Literature Review

Although wage-subsidy programs have been implemented to a limited extent in developing countries, few studies have looked at the benefits developing countries may receive from them. Most studies have analysed wage-subsidy policies using data from an already existing program. Further, very few researchers (Erero, Pambudi, and Bonga, 2013; Pauw, and Edwards, 2006) used Computable General Equilibrium (hereafter, CGE) methodology on the topic of wage subsidies. According to Pauw and Edwards (2006), the benefits of CGE modelling in evaluating an employment-subsidy program in South Africa could be attributed to the fact that CGE models “are employed extensively in policy analysis because they simulate a market economy and serve as a useful tool to analyse ‘cross-cutting issues’ that have an economy-wide impact. These models capture the interactions between markets and economic agents while maintaining key macroeconomic balances. They can thus be tailored around analysing specific issues such as the financing of the wage subsidy scheme” (Arndt and Lewis, 2000, 4). No study has used CGE modelling to examine wage subsidies focused on women in Zambia.

Pauw (2003) analyzed the effect of a wage-subsidy program on unemployment in South Africa using a CGE model. This had the advantage of highlighting the possible transmission mechanism of implementing a wage-subsidy program in the economy. Unlike our research, Pauw (2003) did not disaggregate by gender, skills, and type of employment. In spite of this, the study findings suggested that the direct employment effect of the wage subsidy was counteracted because of the need to raise revenue to fund the subsidy. However, the study noted that effective targeting of labour-intensive industries would reduce the cost of the subsidy significantly.

Still using a CGE model to analyse the wage-subsidy program in South Africa and focusing on youth, Pauw and Edwards (2006) obtained results that were of interest to countries interested in a more targeted wage subsidy. Their results suggested that employment for the targeted group increased as a result of the wage subsidy. The major challenge with their proposed wage-subsidy program was the increased financial costs. Meanwhile, Burns, Edwards, and Pauw (2010) used CGE to suggest that the funding burden of a wage-subsidy program in South Africa fell more on wealthy households while the

unemployed, who were more likely to be located in poorer households, benefitted the most. Burns, Edwards, and Pauw (2010) made the important assumption that unemployed people possessed the skills necessary to engage immediately in employment. Although, in reality, this may not be the case for unemployed people who have never worked before, the suggesting still offers insight into the possible effects of a wage-subsidy program.

Also focusing on youth employment, Pauw and Edwards (2006) and Levinsohn and Pugatch (2014) analysed the wage subsidy implemented by the government to reduce youth unemployment in Cape Town. The study used a structural search model and incorporated the aspect of a reservation wage. The results suggested that a wage subsidy paid to employers led to an increase in wages as well as a reduction in youth unemployment. Employers were encouraged to hire young people because the wages they paid were subsidized, which reduced labour costs.

Erero, Pambudi, and Bonga (2013) also used a CGE model to examine the situation of the Democratic Republic of Congo and provided positive results of a wage-subsidy program for lower-skilled workers there. Their results suggested that government was able to increase the real disposable income of households through the wage subsidy. The results also showed a reduction in the income gap between the informal and formal sectors and an increase in real Gross Domestic Product (hereafter, GDP).

Other studies have focused on developed countries with different economic structures. They have offered insight into the benefits and challenges of wage-subsidy programs. Betcherman, Daysal, and Pagés (2010) analysed employment-subsidy schemes implemented in Turkey, reporting that employment-subsidy schemes led to an increase in jobs registered under the program in targeted areas.

These schemes suffered from dead weight losses, however, which is common to most subsidies as is a substitution effect (Almeida, Orr, and Robalino, 2014). The substitution effect manifests was in form of firms preferring to hire subsidized workers because doing so results in reduced labour costs. Based on the analysis they used (a difference-in-difference- approach), Betcherman, Daysal, and Pagés (2010) did not take into account interdependencies in the economy and acknowledged that they had insufficient data.

Kaiser and Kuhn (2016), conversely, capitalized on more adequate data from people and firms that had gone through the program and looked at the effect of a wage-subsidy program in Denmark on individuals and firms. They used propensity-matching scores to match the treatment and control groups and then ran a multivariate regression on their findings. Their results suggested that the program had a positive effect on employment and earnings before it expired.

Despite using a different methodology and not focused in the labour market, Wolff and Reinthaler (2008) offered insight into the possible benefits of a wage subsidy. They looked at the effectiveness of wage subsidies focused on research and development. Using an instrumental regression model, they reported that, as the result of a subsidy on research and development, wages for scientists increased and spending for research and development also increased.

Other studies worth noting were done using CGE models and focused on the labour market. The work of Fontana (2002) was of interest because it focused on the effects of trade on women in Zambia. They used a gendered CGE model calibrated to a 1995 Zambian Social Accounting Matrix (hereafter, SAM). Fontana considered leisure and the time use by households, finding that liberalization of manufactured imports, although effective, caused smaller employment and wage gains for women than for men. Reallocation of assets from maize to women-intensive crops made women more productive, meanwhile, but reduced their leisure time. Fontana finally suggested that women needed programs that focused on them to improve their standard of living.

Decaluwé and Cockburn (2003) looked at a CGE model for the Nepalese economy to analyse the effects of trade on gendered work in the market and at home. Similar to Fontana (2002), they also incorporated leisure. Their study showed that the complete elimination of tariffs on imported goods in Nepal benefited the income distribution of women more than of men.

Agramont et al. (2017) used a CGE model to evaluate the impact of labour and wage policy on Bolivia's economy in the event of a reduction in the price of exports. A labour-supply function allowed migration between formality and informality. Their study showed that a correction in labour and wage policy that was dependent on external market

conditions was needed. Additionally, the study proposed that informal workers should be part of the debate on salary increments.

III. Data

The 2010 Supply and Use Tables (hereafter, SUT) were the starting point in the creation of the SAM we used. The SUT is a matrix that involves the compilation of a set of integrated production and generation-of-income accounts for industries (Leadership Group, 2003). The SUT was compiled by the Central Statistics Office as part of the implementation of the 2008 System of National Accounts. Because the 2010 SUT provided information on all accounts apart from transfers and a breakdown of taxes account, we used it to obtain the activities and commodities for the SAM. To obtain information on transfers and the tax accounts, we used the guidance of official documents to make various assumptions; other assumptions that concerned factor incomes and, in particular, mixed income were also made based on the literature.

3.1 Social Accounting Matrix Benchmark Statistics

The SAM used in our research was composed of two factors of production, capital and labour. The disaggregation of factors attempted to capture the transmission of sector-based shocks to household income by taking into account differences in the structure of factor endowments among household categories. Labour was decomposed into eight categories based on gender, skill, and formality, resulting in Skilled Formal Workers, Unskilled Formal Workers, Skilled Informal Workers, and Unskilled Informal Workers for both men and women. Educational attainment was used as a deciding factor on skills. Those with skills were assumed to have obtained some form of certificate or better. This information was drawn from the 2012 Labour Force Survey. The model distinguished among thirteen sectors while households were distinguished by location into rural and urban.

Using the SAM, some benchmark statistics were computed to characterize the structure of the economy while giving attention to the gender structure of the economy. Given the large dimension of the SAM, such statistics were helpful in trying to understand the complex economy it represented. The database, in combination with the CGE model's theoretical specifications, described the main real inter-linkages in the Zambian economy. One distinguishing feature of the computational framework of modern CGE models, such as the one we implemented, is the ability to cope with many highly disaggregated dimensions. Modellers are therefore able to conduct simulations across multiple industries, commodities, occupations, and household types. An added benefit of the CGE model implemented in this research was its disaggregation and detail of the labour market, which allowed for full analysis of certain policies—especially those that directly target the labour market. Wage subsidies intended to increase women's participation in the formal sector, which we examined, is one such policy (Boeters, and Savard, 2013).

As Boeters and Savard (2013) also mentioned, CGE models allow modellers to locate the effects of the initial shock of an implemented policy in an outcome variable. Some of the most common variables of CGE models are typical macro variables such as GDP, national income, investment, exports, and imports. Additionally, CGE models can simulate the effects of certain policies on different sectors in the economy and employment (Boeters and Savard, 2013, 1649). Most importantly, depending on the level of disaggregation in the labour market, CGE models can show potential effects on such labour-market variables as wages, participation, employment, and unemployment by skill group and—of particular interest to us in this research— by gender (Boeters and Savard, 2013, 1649). There is a variety of reasons for adding labour market details when designing a CGE model because factors such as gender, for example, affect the labour market directly.

Further, microeconomic data in the SAM were used to describe the economy in terms of shares and thereby give an overview of the economy without losing detail. Burfisher (2011) argued that it also allowed for quick comparisons and identification of the most important features of the economy and became invaluable when interpreting results. Table 3.1 highlights the structure of production and the pattern of foreign trade in the Zambian economy.

Table 3.1: Production structure and trade in Zambia

Sector	Share					
	of GDP	Labour	Capital	Intermediates	Exports	Imports
Agriculture	8.9	4.5	5.8	8.2	3.5	0.3
Mining and quarrying	12.2	8.8	23.8	17.6	75.3	21.5
Manufacturing	7.7	9.1	11.7	28.9	14.5	70.4
Electricity, water and gas	2.0	1.4	4.0	1.3	0.3	0.0
Construction	10.2	18.0	4.0	9.4	0.0	2.7
Private Services	47.9	26.0	45.5	27.6	6.0	5.1
Public Services	11.1	32.1	5.2	6.9	0.4	0.0
Total	100	100	100	100	100	100

Source: Authors' calculations based on the 2010 SAM.

Table 3.1 shows that the private services sector¹ was the largest contributor to GDP, accounting for about 47.9%, followed by public and construction sectors at 11.1% and 10.2%, respectively. Employment of labour was highest in the public sector at 32.1%, followed by the private sector at 26%. The private-services sector also used about 45.5% of the capital stock, followed by mining and quarrying at 23.8%. The demand for intermediate commodities was highest in manufacturing, accounting for about 28.9%, followed by private services at 27.6%. Interestingly, mining contributed about 12.2% to GDP but was the largest source of total exports (about 75.3%). The manufacturing sector also contributed about 7.7% to GDP but was the largest demander of imports accounting for about 70.4% of all the imports in the country.

Table 3.2 shows the value added composition in the economy. It shows that for the informal sector, male labour was comparably more important for the construction, manufacturing and mining sectors while women labour was more important for the agriculture and services sectors. For the formal sector, male labour was almost dominant in all the sectors except education and the financial and insurance services sectors. For capital, it was more important for the electricity, mining and manufacturing sectors.

¹ Private services includes wholesale, trade and transport, accommodation, information and communication, financial and insurance, and real estate. Public services includes public services, education, and other services.

Table 3.2: Value-added composition

	MALSI	MALUI	FEMSI	FEMUI	MALSF	MALUF	FEMSF	FEMUF	CAP	Total
AFF	0.1	26.3	0.1	29.4	0.0	1.3	0.0	0.5	42.4	100
MAQ	0.6	2.8	0.2	1.2	2.4	12.0	0.2	1.2	79.3	100
MAN	0.9	13.9	0.6	8.9	0.7	10.1	0.1	1.7	63.1	100
ELE	0.5	2.2	0.7	3.6	1.7	8.2	0.5	2.3	80.4	100
CON	1.7	55.9	0.1	2.5	0.4	13.7	0.0	0.4	25.3	100
WTS	0.8	15.6	0.9	16.8	0.4	6.9	0.1	2.3	56.2	100
ACF	0.6	6.0	1.2	12.4	1.0	10.2	0.6	6.2	61.9	100
IAC	1.5	10.5	1.0	7.1	1.2	8.6	0.8	5.6	63.7	100
FAI	1.8	2.9	0.9	1.6	7.5	12.2	7.3	11.9	53.9	100
REA	1.8	7.6	2.3	9.4	1.0	4.0	0.6	2.6	70.6	100
PUB	1.5	8.1	0.3	1.7	7.2	39.1	1.6	8.6	31.8	100
EDU	1.7	1.9	1.7	1.9	16.3	18.0	15.2	16.9	26.3	100
SER	2.7	14.7	9.7	52.4	0.7	3.6	0.6	3.5	12.1	100

Source: Authors' calculations based on 2010 SAM.

MALSI=Male skilled informal, MALUI=Male unskilled informal, FEMSI=Female skilled informal, FEMUI=Female unskilled informal, MALSF=Male skilled formal, MALUF=Male unskilled formal, FEMSF=Female skilled formal, FEMUF=Female unskilled formal. Abbreviations from the 2010 SAM: CAP=Capital; AFF=Agriculture; MAQ=Mining; ELE=Electricity and water supply; CON=Construction; WTS= Wholesale, trade, and transport; ACF=Accommodation; IAC=Information and communication; FAI= Financial and insurance; REA=Real estate; PUB=Public; EDU=Education; SER=other services.

Table 3.3 gives a summary of tax accounts. In general, total tax revenue makes up about 12% of GDP. Personal income tax was the largest contributor to tax revenue followed by Value Added Tax and corporate income tax, respectively. Import tariffs account for about 18.2% of total tax revenue while other product taxes account for 13.4%.

Table 3.3: Tax structure in Zambia

Category	Percent of total revenue	Percent of GDP
Direct Taxes		
Personal income tax	35.4	4.4
Corporate tax	22.3	2.8
Indirect Taxes		
Value Added Tax	25.0	3.1
Sales tax	0.0	0.0
Import tariffs	18.2	2.3
Product subsidies	-14.2	-1.8
Other product taxes	13.4	1.7
Activity Taxes		
Export tax	0.00	0.0
Total	100	12

Source: Authors' calculations based on the 2010 SAM.

IV. Methodology

The standard PEP 1-1 CGE model developed by Decaluwé, et al. (2013) was extended to carry out the analyses for this research. Labour was disaggregated according to skill, gender, and formality. It was assumed that a women worker could move from the informal into the formal sector. Women who were skilled workers in the informal sector might have an opportunity to join skilled women formal workers. Similarly, unskilled women workers in the informal sector might also have an opportunity to join unskilled women workers in the formal sector. The major distinction between these sectors was social security coverage and other worker entitlements received regardless of skills.

The wage rate in the formal sector was fixed so that the movement of workers into the formal sector did not lead to a drop in the wage rate. Labour supply for formal workers was fixed and was endogenous for informal workers. Further, the model assumed that working women and working men were imperfect substitutes.

To ensure that the above assumptions were captured in the model, labour in the production structure was disaggregated in several steps. First, labour was broken down into subsets that captured the different skills that were incorporated into the model. To do so, the varying skills of labour were considered as subset of the labour represented in production as follows:

$$L = \{l_{sk}, l_{unsk}\}$$

Where l_{sk} = skilled labour and l_{unsk} = unskilled labour.

The skilled subset of labour was further disaggregated according to gender;

$$l_{sk} \in L = \{F_{sk}, M_{sk}\}$$
$$l_{unsk} \in L = \{F_{unsk}, M_{unsk}\}$$

Which was then broken down into formal and informal-sector employment as follows;

$$F_{sk} \in l_{sk} \in L = \{F_{SI}, F_{SF}\}$$
$$M_{sk} \in l_{sk} \in L = \{M_{SI}, M_{SF}\}$$
$$F_{unsk} \in l_{unsk} \in L = \{F_{UI}, F_{UF}\}$$
$$M_{unsk} \in l_{unsk} \in L = \{M_{UI}, M_{UF}, \}$$

Therefore, the labour account was classified as follows:

$$L = \{F_{UI}, F_{SI}, F_{UF}, F_{SF}, M_{UI}, M_{SI}, M_{UF}, M_{SF}\}$$

Where F_{UI} = Female unskilled informal ; F_{SI} = Female skilled informal ;

F_{UF} = Female unskilled formal ; F_{SF} = Female skilled formal;

M_{UI} = Male unskilled informal ; M_{SI} = Male skilled informal ;

M_{UF} = Male unskilled formal ; M_{SF} = Male skilled formal

Given this, the equation defining the different types of labour demanded by an industry is defined as follows:

$$LDC_j = B_j^{LD1} \left(\left[B_j^{LD1} * LDS_j^{-\rho^{LD1}} \right] + \left[(1 - B_j^{LD1}) * LDU_j^{-\rho^{LD1}} \right] \right)^{-1/\rho^{LD1}} \quad \text{Equation 1}$$

Where LDS_j and LDU_j are skilled labour demand and unskilled labour demand, respectively. They are defined as follows:

$$LDS_j = B_j^{LD2} \left(\left[B_j^{LD2} * LDSF_j^{-\rho^{LD2}} \right] + \left[(1 - B_j^{LD2}) * LDSM_j^{-\rho^{LD2}} \right] \right)^{-1/\rho^{LD2}} \quad \text{Equation 2}$$

$$LDU_j = B_j^{LD3} \left(\left[B_j^{LD3} * LDUF_j^{-\rho^{LD3}} \right] + \left[(1 - B_j^{LD3}) * LDUM_j^{-\rho^{LD3}} \right] \right)^{-1/\rho^{LD3}} \quad \text{Equation 3}$$

Where

$LDSF$ = Female Skilled Labour Demand; $LDSM$ = Male Skilled Labour Demand;

$LDUF$ = Female unskilled labour Demand; LDU = Male Unskilled Labour Demand

These equations representing labour demand were specified in the Constant Elasticity of Substitution (CES) format. Therefore, in order for the firm to maximize profits, the marginal product of labour should be equal to the wage rate.

In this research, the wage subsidy was designed to be offered to the employer only when a women worker was employed in the formal sector. To capture this, the bottom level of labour demand was specified as follows:

$$LD_{ij} = \left[\frac{\beta_{ij}^{LD} w_l}{WTI_{ij}} \right]^{\sigma_j^{LD}} (B_j^{LD})^{\sigma_j^{LD} - 1} LD_{sg} \quad \text{Equation 4}$$

where LD_{ij} = type of labour demanded by industry j;

B_j^{LD} = is the Scale parameter for type l of labour;

σ_j^{LD} = elasticity of substitution,;

W_l = wage rate received by type l labour;

WTl_{ij} = wage rate paid by industry j for type l labour (including payroll taxes);

LD_{sg} = type l labour demand classified by type of gender, skill and formality.

The variable LD_{sg} captured the different types of labour based on skill, gender and informality as well as the associated price of the various types of labour.

To achieve the objective of this research, the PEP 1-1 model was extended to offer policy makers insight into how the subsidy strategy would work, its costs, and its benefit implications for the economy. In addition, the model discussed possible financing options and their implications. The wage subsidy would be based on the government's proposed plan to increase the number of women in the formal sector until the target of 45% is reached, a 16.4% increase over current levels.

The wage subsidy is a function of the total revenue government obtained on a particular worker relative to the amount paid for the labour demand less the tax rate on that worker. This was represented by the following equation:

$$wsub_l = \frac{GRT_{ij}}{LD_{lj} \cdot W_l} - Tax_{ij} \quad \text{Equation 5}$$

where

GRT_{ij} = government revenue from payroll taxes on type l labour in industry j;

Tax_{ij} = tax rate on type l worker compensation in industry j;

$wsub_l$ = wage subsidy rate

By introducing the wage subsidy in this format, both the cost of adding women workers to the formal sector and implications for the economy could be captured. Based on this, this research offers policymakers financing options.

4.1 Simulations

To capture the functioning of the economy, the closures used were a close approximation of the Zambian economy. Capital was assumed to be sector-specific to capture the different types of capital used across activities. The current account balanced was fixed, and the exchange rate was used as the numeraire.

We applied four simulations. Simulation One (SIM1) introduced the wage subsidy as it would be offered through employers in selected sectors. In this simulation, government savings were endogenous and real current government expenditures on goods and services were fixed. We used sectors that could absorb a high concentration of women workers—that is, those that were already disposed to employ women and where the chances of women working were improved. These included wholesale and transport, accommodation, financial, and education. Undeniably, the implementation of the subsidy would be costly for the government, raising questions about financing the subsidy and the consequences of that financing on the economy. We therefore went a step further and analyzed the effect on the economy of implementing the wage subsidy together with a financing option. We were thus also able to offer insight to policymakers insight into how men and women would be affected by the implementation of the wage subsidy as well as the various financing options.

Simulations Two, Three, and Four built on Simulation One by focusing on selected sectors and highlighting the effect of implementing a wage subsidy while also taking various financing options into account. They considered the effect of the financing option on labour as well. Expectedly, the introduction of the wage subsidy increased government expenditure, implying, therefore, the need for the government to finance it. One way government can finance this subsidy was through the use of its revenue. Based on the economy's structure, the major sources of government revenue were corporate, household, and indirect taxes, and we captured the economic implications of using these sources as well as insight into potential transmission mechanisms.

In Simulation Two (SIM2), real current government expenditure and government savings were fixed. An endogenous adjustment factor that captured the cost of using higher corporate taxes was introduced. In Simulation Three (SIM3), real current government

expenditure and government savings were also fixed. In this case, an endogenous adjustment factor that captured the cost of using higher household taxes was instead used. In Simulation Four (SIM4), we continued to apply the closures used in Simulations Two and Three, but an endogenous adjustment factor that captured the cost of using higher indirect taxes was considered.

V. Application and Results²

In analysing the effects of the various simulations, we focused on how the adoption of a wage-subsidy program would affect the labour market, production, and prices of local products. The study also considered how government, households, and the macro economy would be affected. In making these considerations, we outline the consequences of various financing options.

5.1 Impact on the Labour Market

The implementation of a wage subsidy that targeted women workers would increase their participation in the formal sector as shown in Table 5.1. The combination of the wage subsidy with a financing method did not change this effect on women workers. However, the combination of a wage subsidy with a possible financing method did affect other workers differently, as seen in SIM2, SIM3, and SIM4. Working men were not greatly disadvantaged because there were more unskilled men in the formal sector, and some reduction was seen for unskilled working men in the informal sector. As the result of other intermediate effects, unskilled working men were pulled from the informal to the formal sector. Skilled men in informal work also benefited from the implementation of a wage subsidy by experiencing a 3.4% increase in labour supply. This may have been a result of an

² A sensitivity analysis was carried out on the elasticities used in the model.

increase in demand for these types of workers as relative wages fell. This can be seen in Table 5.2. The model continued to equate labour demand with labour supply.

Table 5.1: Percent change in labour supply

Labour supply	Wage subsidy with financing option			
	SIM1	SIM2	SIM3	SIM4
Men - Skilled Informal	3.4	2.7	3.8	4.14
Men - Unskilled Informal	-0.5	-0.8	-0.4	-0.28
Women - Skilled Informal	-27.8	-27.8	-27.8	-27.8
Women - Unskilled Informal	-5.4	-5.4	-5.4	-5.4
Men - Skilled Formal	-1.4	-1.2	-1.6	-1.8
Men - Unskilled Formal	0.7	1.2	0.7	0.4
Women - Skilled Formal	16.4	16.4	16.4	16.4
Women - Unskilled Formal	16.4	16.4	16.4	16.4

Source: Authors' calculations.

As a consequence of the increase of women workers in the formal sector, women in the informal sector also experienced some form of empowerment, and their wages rose, as shown in Table 5.2. The increase in wages was more pronounced for skilled women workers in the informal sector who experienced a 37.4% increase in their wage rate. In this regard, the overall objective of empowering women in the economy could be achieved.

Table 5.2: Change in wage rate of type I labour

Wage rate	Wage subsidy with financing option			
	SIM1	SIM2	SIM3	SIM4
Men - Skilled Informal	-1.8	-0.8	-2.3	-2.8
Men - Unskilled Informal	2.6	3.5	2.6	2.0
Women - Skilled Informal	37.4	37.9	37.1	36.8
Women - Unskilled Informal	8.3	8.8	8.1	7.4

Source: Authors' calculations.

The effect was greater when a corporate tax was used to finance the wage subsidy. Skilled women workers in the informal sector experienced a 37.9% increase in their wage rate. Because wages for women workers in the formal sector were fixed, employing them was relatively cheaper because the subsidy lowered labour costs. Studies by Pauw (2003) and Pauw and Edwards (2006) highlighted this positive impact of wage subsidies. On the other hand, skilled men working in the informal sector experienced a reduction in the wage rate even as the wages of unskilled working men increased. This could be attributed to an increase in the labour supply of men in the informal sector as shown in Table 5.1.

5.2 Impact on Production

The direction of percent changes in total aggregate output of the industries as a result of the introduction of the wage subsidy for formal-sector women workers was mixed (see Table 5.3). However, it can be observed that, on average, production in capital-intensive sectors fell as the relative price of capital to wage increased, simultaneously increasing the cost of production slightly. Meanwhile, production in the education industry, which employs more women workers than use of capital, increased in SIM1 (3.7%) when the subsidy was introduced. If the wage subsidy was coupled with its financing option, the education sector still experienced 3.7%, 3.6%, and 3.7% increase in simulations SIM2, SIM3 and SIM4, respectively. The education sector is women-intensive, and a possible explanation for these increases was that, because fewer sectors could accommodate the 16.4% increase, most of these women would be employed in education. This reduced the cost of production because the wages of women employed were subsidized, thereby increasing production.

Table 5.3: Percent change in total aggregate output of industry j production

Industry	Wage subsidy with financing option			
	SIM1	SIM2	SIM3	SIM4
Agriculture	-0.3	-0.4	-0.4	-1.5
Mining and quarrying	-0.8	-1.0	-0.7	-0.5
Manufacturing	-0.3	-0.3	-0.4	-0.1
Electricity and water supply	0.0	-0.1	-0.1	0.1
Construction	-0.6	-0.2	-0.1	0.1
Wholesale, trade, and transport	-0.1	-0.1	-0.2	-0.2
Accommodation and food	0.1	-0.1	0.1	0.3
Information and communication	0.2	0.3	0.1	0.1
Financial and insurance	0.5	0.6	0.5	0.5
Real estate	0.1	0.0	-0.2	0.0
Public administration	-0.5	-0.4	-0.5	-0.6
Education	3.7	3.7	3.6	3.7
Other services	-2.5	-2.5	-2.7	-2.4

Source: Authors' calculations.

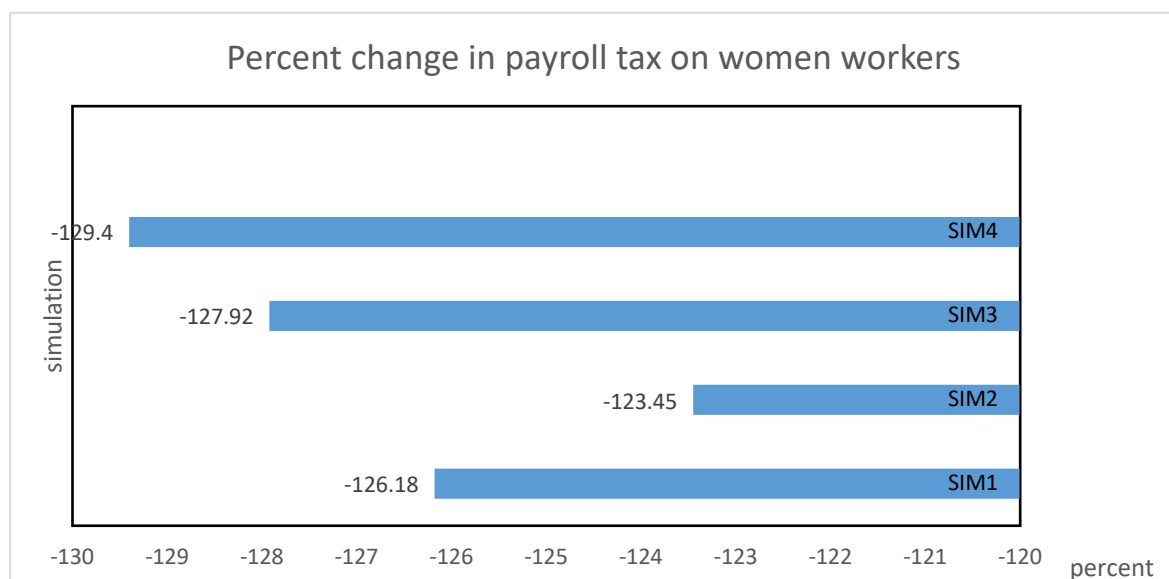
The effect of the wage subsidy on the other services sector was contrary to that experienced in the education sector: a 2.5% reduction in production when a subsidy was implemented. The other services sector was affected because workers left the informal part of this sector, which pushed the relative wage rate, thereby increasing the cost of

production. In reaction to this, less was produced. This sector was heavily reliant on informal workers as shown in Table 3.2.

5.3 Impact on Government Revenue

Figure 5.1 shows the change in government revenue from women workers in the formal sector. It shows that, when the share of lost revenue from women workers was considered alone, the drop was greater in SIM4 when a wage subsidy was coupled with indirect taxes because the share fell by 129.4%. A possible reason for this was that indirect taxes were a smaller share of government revenue compared to the other sources of revenue, implying that more indirect taxes would need to be used to achieve the targeted increase of women in the formal sector.

Figure 5.1: Percent change in government revenue from payroll taxes on women workers only



Source: Authors' calculations.

Because the wage-subsidy design affected payroll taxes, the revenue received by government from these taxes fell compared to other sources of government revenue as shown in Table 5.4. According to in SIM1, if the wage subsidy were implemented, payroll taxes would fall by 37.9%. Other taxes would increase only marginally; the highest percentage increases were in production and household taxes (2.3% and 2.2%, respectively). The wage subsidy increased the labour supply of women workers, which

improved their income and ultimately increased household taxes collected. Similarly, it reduced labour costs in labour-intensive sectors which led to an increase in production and, as a result, in production taxes collected.

However, if the wage subsidy was implemented together with a financing option, the value of the financing option (which is a specific tax) experiences a greater increase compared to other sources of revenue. Corporate taxes increases by 9.4% in SIM2 if they were considered a financing option. Household taxes experienced a 7.5% increase while indirect taxes increased by 11.9% if they were considered as financing options (see SIM3 and SIM4, respectively). In these latter two simulations, government revenue declined slightly (0.04% in SIM3 and 0.2% in SIM4). This can be attributed to the greater decline in payroll taxes of 37.8% in SIM3 and 38.4% in SIM4, both of which affected government revenue negatively.

Table 5.4: Percent change in sources of government revenue

Source	Wage subsidy with financing option			
	SIM1	SIM2	SIM3	SIM4
Government revenue	0.03	0.3	-0.04	-0.2
Corporate taxes	1.4	9.4	1.2	0.9
Household taxes	2.2	2.5	7.5	1.8
Indirect taxes	0.8	1.1	0.7	11.9
Import duties	1.1	1.3	0.9	0.8
Production taxes	2.3	2.8	2.1	1.7
Payroll taxes	-37.2	-36.2	-37.8	-38.4
Taxes on products and imports	0.9	1.2	0.8	5.3

Source: Authors' calculations.

5.4 Impact on Income and Savings

If a wage subsidy were to be implemented, government income would possibly experience a reduction of 1.1% as shown in SIM1. However, when combined with a financing option, government income could also increase: by 0.7% in SIM2, 0.4% in SIM3, and 0.2% in SIM4.

Because women's labour supply increased in the formal sector, rural and urban household income also increased in all simulations. As suggested in studies by Erero, Pambudi, and Bonga (2013) and Levinsohn and Pugatch (2014), this result was expected

and could be attributed to an increase in labour incomes as more women workers entered the formal sector. Rural households experienced a greater change in labour income compared to urban households, as seen in SIM2, with a 3.8% increase in labour income. This would translate into improvement of living standards for rural households. In spite of this, urban household had a greater increase than rural households in total income. Urban households experienced the greater change in income in SIM2 (2.6%).

Table 5.5: Percent change in income by agent

Agent	Wage subsidy with financing option			
	SIM1	SIM2	SIM3	SIM4
Government income	-1.1	0.7	0.4	0.2
Business total income	0.4	0.8	0.3	-0.02
Household total income				
Rural	2.1	2.4	2.0	1.7
Urban	2.3	2.6	2.2	1.8
Household labour income				
Rural	3.3	3.8	3.3	2.9
Urban	3.1	3.5	3.0	2.6

Source: Authors' calculations.

Government savings dropped by 30.1% in SIM1 because savings were endogenous in this simulation while fixed in the other simulations (see Table 5.6). The savings reduction was expected because the fall in government income was greater than the fall in current government expenditures in the simulation.

Table 5.6: Percent change in savings by agents

Agent	Wage subsidy with financing option			
	SIM1	SIM2	SIM3	SIM4
Government	-30.1			
Firms	0.4	0.1	0.2	-0.1
Household				
Rural	2.1	2.4	1.6	1.7
Urban	2.3	2.6	1.9	1.8

Source: Authors' calculations.

Table 5.6 also shows that urban households experienced a greater increase in savings compared to firms and rural households because of a greater increase in total income among urban compared to rural households. In SIM4, firms experienced a fall in savings of 0.1% because indirect taxes were used a financing option for the wage subsidy.

5.5 Impact on Women’s Empowerment and Household Welfare

The effect of the wage-subsidy program on women’s empowerment cannot be measured solely by the increase of women’s participation in the formal sector but also in the change in the income they contribute to the household which, in turn, has implications for their ability to participate in household decision-making. Alkire et al. (2013), although focused on the women’s empowerment index in agriculture, pointed out that income improved the level of empowerment, though this result was not guaranteed. Further, income was one important component in the women’s empowerment index. In most cases, moreover, an increase in women’s income compared to men’s led to better outcomes for households and especially for children. Duflo (2012) highlighted the previous statement when linking women’s empowerment and economic development. Table 5.7 shows household labour income by type of labour.

Table 5.7: Household Labour Income by Type of Labour

Type of labour	Household	Wage subsidy with financing option			
		SIM1	SIM2	SIM3	SIM4
Women formal workers	Rural	16.4	16.4	16.4	16.4
	Urban	16.4	16.4	16.4	16.4
Women informal workers	Rural	2.2	2.7	2.0	1.4
	Urban	2.2	2.6	1.9	1.4
Men formal workers	Rural	0.4	0.8	0.3	0.12
	Urban	0.2	0.6	0.1	-0.07
Men informal workers	Rural	2.08	2.7	2.1	1.7
	Urban	2.06	2.6	2.0	1.6

Source: Authors' calculations.

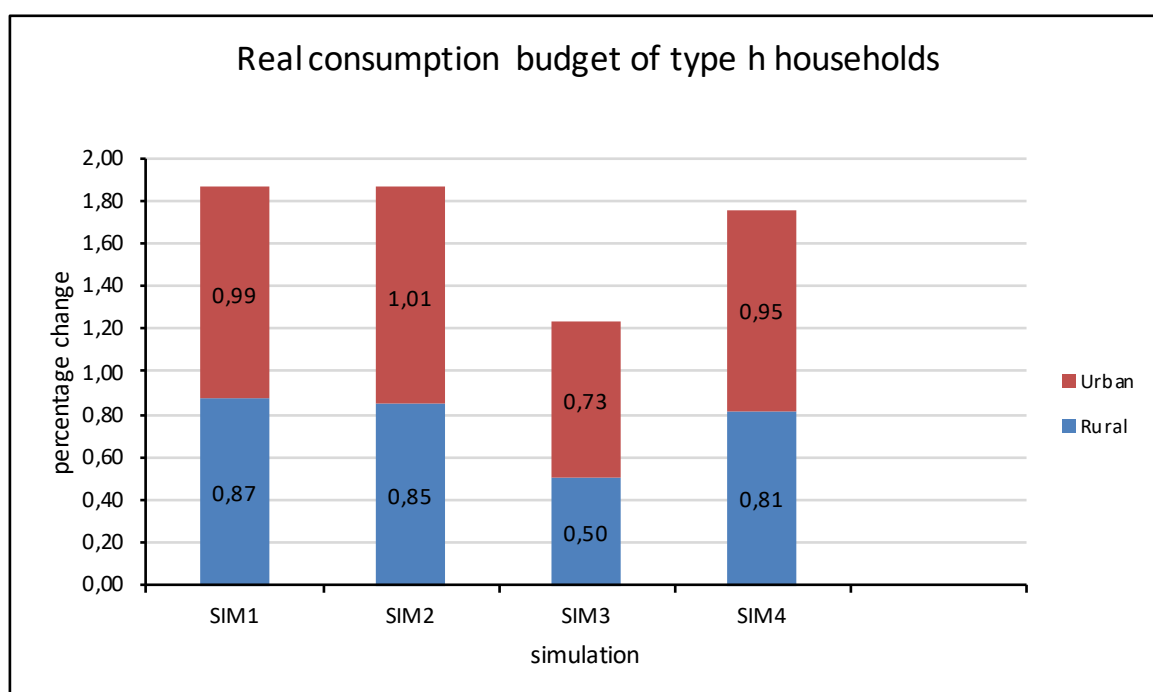
Table 5.7 shows that an increased number of women workers in the formal sector resulted in a 16.4% increase in the amount of labour income they contributed to their households in all simulations. Women in the informal sector benefited as well, however, because they also increased their contributions to household income. The highest increase for women informal workers was seen in SIM2 (a 2.7% change in contribution to household labour income in rural households compared to a 2.6% change in urban households).

As for working men, men in the informal sectors experienced a greater increase than those in the formal sector. The highest contributions were seen in simulation SIM2 in which men in the informal sector made a contribution of 2.7% and 2.6% toward the labour income

in rural and urban households, respectively. Men in urban households employed in the formal sector experienced a slight reduction of 0.07% in SIM4.

We used households' real consumption budgets to measure welfare. Figure 5.2 shows that both rural and urban households benefitted from the wage subsidy because their real consumption budget increased in all simulations, though the budgets of urban households increased more than did those of rural households. The change was greater in SIM2 and lower in SIM3 because, in the latter, the wage subsidy was financed through household taxes with 1.0% and 0.7% increases for urban and rural households, respectively.

Figure 5.2: Change in households' real consumption budget



Source: Authors' calculations.

5.6 Impact on Macroeconomic Variables

The introduction of a wage-subsidy program led to an increase in the change of all of the macroeconomic variables in SIM1. Gross Domestic Product (GDP) at basic prices and GDP at market prices increased by 1.4% and 0.4%, respectively.

Table 5.8: Impact on macroeconomic variables

Variable	Wage subsidy with financing option			
	SIM1	SIM2	SIM3	SIM4
Gross fixed capital formation	0.6	1.6	1.2	1.1
GDP at basic prices	1.4	1.8	1.3	0.9
GDP at market prices	0.4	0.4	0.4	0.4
Total investment expenditure	0.7	1.6	1.2	1.1

Source: Authors' calculations.

When the wage subsidy was implemented with a financing option, as in SIM2, the increased in macroeconomic variables was greater compared to the other simulations. The wage subsidy led to an improvement in the economy, though the economy would have performed better if the introduction of a wage subsidy had been accompanied by an increase in corporate taxes. Although the wage subsidy reduced government revenues from payroll taxes, the overall effect was an increase in consumption, government expenditure, and total investment, which translated into a positive change in GDP at market prices for all simulations. Given the underlying theory, this was expected because an increase in income (as shown in Table 5.5) led to an increase in consumption of most commodities. In addition, increased income entailed an increase in savings which translated into an increase in investment. Further, the wage subsidy reduced the cost of production for labour-intensive sectors, which allowed these industries to produce more, ultimately benefitting the economy. The amount of the wage subsidy was approximately only 0.4% of the GDP at market prices in all simulations.

VI. Conclusions and Policy Implications

The implementation of a wage-subsidy strategy could potentially increase the number of women workers in the formal sector. On one hand, the wage-subsidy strategy could result in greater empowerment of women because some women would have access to formal work that offered better income and other entitlements. Further, women workers

in the informal sector would also benefit from the increase in their wage rate, and their increased income could lead to an increase in household income as well. Women would be empowered because they would be able to contribute more to household income, which could translate into greater bargaining power in the household. Rural households would benefit more than urban households. A wage subsidy also improved the welfare of households in cases in which their consumption budget increased.

On the other hand, depending upon the design of the program, the wage-subsidy strategy could lead to a slight reduction in government revenue. If the wage subsidy were to be financed through corporate and household taxes, government would benefit through increased income. However, financing the wage subsidy through indirect taxes did not benefit the economy and slightly disadvantaged working men. This was expected because such taxes have a greater impact on male workers (United Nations Conference on Trade and Development, 2017), an effect that is more prominent where men earn more than women. The wage subsidy also increased the cost of production and, as a result, of goods. Therefore, implementing a wage subsidy financed by higher corporate taxes benefitted all forms of labour, and working men were not adversely affected.

Based on this research, the cost of the wage subsidy appeared minimal compared to the change in GDP. A wage subsidy would also not affect government revenue if properly and carefully designed and accompanied by an appropriate financing option. Future research should consider analysing a dynamic version of the model so that the running period of the wage subsidy can be captured and insights can be provided on the long term-effect of a wage subsidy on women joining the formal sector.

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Appendix

Labour demand by sector

Labour Demand by Sector SIM1								
	MALSI	MALUI	FEMSI	FEMUI	MALS F	MALUF	FEMSF	FEMU F
Agriculture	6.42	1.38	-26.49	-4.45	4.27	4.27	4.27	4.27
Mining and quarrying	2.58	-2.28	-29.15	-7.9	0.51	0.51	0.51	0.51
Manufacturing	4.47	-0.47	-27.84	-6.19	2.36	2.36	2.36	2.36
Electricity and water supply	4.2	-0.74	-28.03	-6.44	2.09	2.09	2.09	2.09
Construction	3.73	-1.18	-28.35	-6.86	1.64	1.64	1.64	1.64
Wholesale, trade, and transport	4.74	-0.22	-27.65	-5.96	2.62	2.62	27.9	31.88
Accommodation and food	2.6	-2.26	-29.13	-7.88	0.53	0.53	25.08	28.94
Information and communication	4.89	-0.08	-27.55	-5.82	2.77	2.77	2.77	2.77
Financial and insurance	-1.83	-6.48	-32.19	-11.86	-3.81	-3.81	15.94	18.94
Real estate	5.99	0.97	-26.79	-4.83	3.85	3.85	3.85	3.85
Public administration	2.38	-2.47	-29.28	-8.07	0.31	0.31	0.31	0.31
Education	-1.26	-5.93	-31.79	-11.34	-3.25	-3.25	18.95	22.4
Other services	7.88	2.77	-25.49	-3.14	5.69	5.69	5.69	5.69

Source: Authors' calculations.

Labour demand by Sector SIM3								
	MALSI	MALUI	FEMSI	FEMUI	MALS F	MALUF	FEMSF	FEMUF
Agriculture	6.68	1.13	-26.49	-4.49	4.01	4.01	4.01	4.01
Mining and quarrying	3.11	-2.26	-28.95	-7.68	0.53	0.53	0.53	0.53
Manufacturing	4.79	-0.66	-27.79	-6.17	2.17	2.17	2.17	2.17
Electricity and water supply	4.55	-0.89	-27.96	-6.39	1.93	1.93	1.93	1.93
Construction	4.69	-0.76	-27.86	-6.26	2.07	2.07	2.07	2.07
Wholesale, trade, and transport	5.07	-0.4	-27.6	-5.93	2.44	2.44	28.07	32.06
Accommodation and food	3	-2.36	-29.03	-7.78	0.42	0.42	25.33	29.2
Information and communication	5.13	-0.34	-27.56	-5.87	2.5	2.5	2.5	2.5
Financial and insurance	-1.49	-6.61	-32.12	-11.79	-3.95	-3.95	16.07	19.08
Real estate	6.1	0.58	-26.89	-5	3.45	3.45	3.45	3.45
Public administration	2.81	-2.54	-29.16	-7.95	0.24	0.24	0.24	0.24
Education	-1.06	-6.21	-31.83	-11.42	-3.54	-3.54	18.94	22.39
Other services	8.02	2.4	-25.56	-3.28	5.32	5.32	5.32	5.32

Source: Authors' calculations.

Labour Demand by Sector SIM2

	MALSI	MALUI	FEMSI	FEMUI	MALSF	MALUF	FEMSF	FEMUF
Agriculture	5.77	0.92	-26.4	-4.41	4.83	4.83	4.83	4.83
Mining and quarrying	1.48	-3.18	-29.39	-8.28	0.58	0.58	0.58	0.58
Manufacturing	3.7	-1.05	-27.84	-6.27	2.78	2.78	2.78	2.78
Electricity and water supply	3.22	-1.52	-28.18	-6.71	2.3	2.3	2.3	2.3
Construction	3.71	-1.04	-27.83	-6.26	2.79	2.79	2.79	2.79
Wholesale, trade, and transport	4.07	-0.7	-27.58	-5.94	3.15	3.15	28.07	31.84
Accommodation and food	1.69	-2.97	-29.24	-8.09	0.79	0.79	24.94	28.58
Information and communication	4.13	-0.64	-27.54	-5.88	3.21	3.21	3.21	3.21
Financial and insurance	-2.58	-7.05	-32.21	-11.95	-3.45	-3.45	16.01	18.85
Real estate	5.19	0.37	-26.8	-4.92	4.26	4.26	4.26	4.26
Public administration	1.41	-3.24	-29.43	-8.34	0.51	0.51	0.51	0.51
Education	-2.1	-6.59	-31.88	-11.52	-2.97	-2.97	18.88	22.14
Other services	7.1	2.19	-25.47	-3.2	6.16	6.16	6.16	6.16

Source: Authors' calculations.

Labour demand by Sector SIM4

	MALSI	MALU	FEMSI	FEMU	MALS	MALUF	FEMS	FEMUF
		I		I	F		F	
Agriculture	5.49	0.1	-27.53	-5.45	2.28	2.28	2.28	2.28
Mining and quarrying	3.61	-1.68	-28.82	-7.13	0.46	0.46	0.46	0.46
Manufacturing	5.28	-0.09	-27.67	-5.63	2.08	2.08	2.08	2.08
Electricity and water supply	5.01	-0.35	-27.86	-5.88	1.81	1.81	1.81	1.81
Construction	4.99	-0.37	-27.88	-5.9	1.8	1.8	1.8	1.8
Wholesale, trade, and transport	5.22	-0.16	-27.72	-5.69	2.02	2.02	27.71	31.94
Accommodation and food	3.4	-1.87	-28.96	-7.32	0.26	0.26	25.3	29.41
Information and communication	5.4	0.02	-27.59	-5.53	2.19	2.19	2.19	2.19
Financial and insurance	-1.13	-6.18	-32.08	-11.38	-4.14	-4.14	15.98	19.16
Real estate	6.53	1.09	-26.82	-4.52	3.29	3.29	3.29	3.29
Public administration	3.1	-2.17	-29.18	-7.59	-0.04	-0.04	-0.04	-0.04
Education	-0.58	-5.65	-31.7	-10.88	-3.6	-3.6	19.02	22.69
Other services	8.39	2.85	-25.54	-2.85	5.09	5.09	5.09	5.09

Source: Authors' calculations.

Variables in the model

Volume variables

C (i,h)	Consumption of commodity i by type h households
CG (i)	Public final consumption of commodity i
CI (j)	Total intermediate consumption of industry j
CMIN (i,h)	Minimum consumption of commodity i by type h households
CTH_REAL (h)	Real consumption budget of type h households
DD (i)	Domestic demand for commodity i produced locally
DI (i,j)	Intermediate consumption of commodity i by industry j
DIT (i)	Total intermediate demand for commodity i
DS (j,i)	Supply of commodity i by sector j to the domestic market
EX (j,i)	Quantity of product i exported by sector j
EXD (i)	World demand for exports of product x
G_REAL	Real current government expenditures on goods and services
GDP_BP_REAL	Real GDP at basic prices
GDP_MP_REAL	Real GDP at market prices
GFCF_REAL	Real gross fixed capital formation
IM (i)	Quantity of product i imported
INV (i)	Final demand of commodity i for investment purposes (GFCF)
KD (k,j)	Demand for type k capital by industry j
KDC (j)	Industry j demand for composite capital
KS (k)	Supply of type k capital
LD (l,j)	Demand for type l labor by industry j
LDC (j)	Industry j demand for composite labor
LDS (j)	Industry j demand for composite labor
LDU (j)	Industry j demand for composite labor
LDSF (j)	Industry j demand for composite labor
LDSM (j)	Industry j demand for composite labor
LDUM (j)	Industry j demand for composite labor
LDUF (j)	Industry j demand for composite labor
LS (l)	Supply of type l labor
MARGN (i)	Demand for commodity i as a trade or transport margin
Q (i)	Quantity demanded of composite commodity i
VA (j)	Value added of industry j
VSTK (i)	Inventory change of commodity i
XS (j,i)	Industry j production of commodity i
XST (j)	Total aggregate output of industry j

Price variables

e	Exchange rate (price of foreign currency in local currency)
P (j,i)	Basic price of industry j's production of commodity i
PC (i)	Purchaser price of composite commodity i (including all taxes and margins)
PCI (j)	Intermediate consumption price index of industry j
PD (i)	Price of local product i sold on the domestic market (including all taxes and margins)
PE (i)	Price received for exported commodity i (excluding export taxes)
PE_FOB (i)	FOB price of exported commodity i (in local currency)

PIXCON	Consumer price index
PIXGDP	GDP deflator
PIXGVT	Public expenditures price index
PIXINV	Investment price index
PL (i)	Price of local product i (excluding all taxes on products)
PM (i)	Price of imported product i (including all taxes and tariffs)
PP(j)	Industry j unit cost including taxes directly related to the use of capital and labor but excluding other taxes on production
PT (j)	Basic price of industry j's output
PVA (j)	Price of industry j value added (including taxes on production directly related to the use of capital and labor)
PWM (i)	World price of imported product i (expressed in foreign currency)
PWX (i)	World price of exported product i (expressed in foreign currency)
R (k,j)	Rental rate of type k capital in industry j
RC (j)	Rental rate of industry j composite capital
RK (k)	Rental rate of type k capital (if capital is mobile)
RTI (k,j)	Rental rate paid by industry j for type k capital including capital taxes
W (l)	Wage rate of type l labor
WC (j)	Wage rate of industry j composite labor
WS (j)	Wage rate of industry j composite labor
WU (j)	Wage rate of industry j composite labor
WSF (j)	Wage rate of industry j composite skilled female labor
WSM (j)	Wage rate of industry j composite skilled male labor
WUF (j)	Wage rate of industry j composite unskilled female labor
WUM (j)	Wage rate of industry j composite unskilled male labor
WTI (l,j)	Wage rate paid by industry j for type l labor including payroll taxes

Nominal (value) variables

CAB	Current account balance
CTH (h)	Consumption budget of type h households
G	Current government expenditures on goods and services
GDP_BP	GDP at basic prices
GDP_FD	GDP at purchasers' prices from the perspective of final demand
GDP_IB	GDP at market prices (income-based)
GDP_MP	GDP at market prices
GFCF	Gross fixed capital formation
IT	Total investment expenditures
SF (f)	Savings of type f businesses
SG	Government savings
SH (h)	Savings of type h households
SROW	Rest-of-the-world savings
TDF (f)	Income taxes of type f businesses
TDFT	Total government revenue from business income taxes
TDH (h)	Income taxes of type h households
TDHT	Total government revenue from household income taxes
TIC (i)	Government revenue from indirect taxes on product i
TICT	Total government receipts of indirect taxes on commodities
TIK (k,j)	Government revenue from taxes on type k capital used by industry j

TIKT	Total government revenue from from taxes on capital
TIM (i)	Government revenue from import duties on product i
TIMT	Total government revenue from import duties
TIP (j)	Government revenue from taxes on industry j production (excluding taxes directly related to the use of capital and labor)
TIPT	Total government revenue from production taxes (excluding taxes directly related to the use of capital and labor)
TIW (l,j)	Government revenue from payroll taxes on type l labor in industry j
TIWT	Total government revenue from payroll taxes
TIX (i)	Government revenue from export taxes on product i
TIXT	Total government revenue from export taxes
TPRCTS	Total government revenue from taxes on products and imports
TPRODN	Total government revenue from other taxes on production
TR (ag,agj)	Transfers from agent agj to agent ag
YDF (f)	Disposable income of type f businesses
YDH (h)	Disposable income of type h households
YF (f)	Total income of type f businesses
YFK (f)	Capital income of type f businesses
YFTR (f)	Transfer income of type f businesses
YG	Total government income
YGK	Government capital income
YGTR	Government transfer income
YH (h)	Total income of type h households
YHK (h)	Capital income of type h households
YHL (h)	Labor income of type h households
YHTR (h)	Transfer income of type h households
YROW	Rest-of-the-world income

Major equations

Production

$$VA_j = v_j XST_j$$

$$CI_j = io_j XST_j$$

$$VA_j = B_j^{VA} \left[\beta_j^{VA} LDC_j^{-\rho_j^{VA}} + (1 - \beta_j^{VA}) KDC_j^{-\rho_j^{VA}} \right] \rho_j^{VA - 1}$$

$$\frac{LDC_j}{KDC_j} = \left(\frac{1 - \beta_j^{VA}}{\beta_j^{VA}} \frac{WC_j}{RC_j} \right)^{\frac{-1}{\rho_j^{VA} + 1}}$$

$$DI_{i,j} = aij_{i,j} CI_j$$

$$XST_j = \overline{XST_j}$$

$$XS_j = \frac{XST_j}{(B_j^{XT})^{1 + \sigma_j^{XT}}} \left[\frac{P_{j,i}}{\beta_{j,i}^{XT} PT_j} \right]^{\sigma_j^{XT}}$$

Commodity Markets

$$EX_{j,i} = \left[\frac{1 - \beta_{j,i}^X}{\beta_{j,i}^X} \frac{PE_i}{PL_i} \right]^{\sigma_{j,i}^X} DS_{j,i}$$

$$IM_i = \left[\frac{\beta_i^M}{1 - \beta_i^M} \frac{PD_i}{PM_i} \right]^{\sigma_i^M} DD_i$$

Institutions

$$YH_h = YHL_h + YHK_h + YHTR_h$$

$$YH_h = \sum_l \lambda_{h,l}^{WL} \left(W_l \sum_j LD_{l,j} \right) + \sum_k \lambda_{h,k}^{RK} \left(\sum_j R_{k,j} KD_{k,j} \right) + \sum_{ag} TR_{h,ag}$$

$$PC_i C_{i,h} = PC_i C_{i,h}^{MIN} + \gamma_{i,h}^{LES} \left(CTH_h - \sum_{ij} PC_{ij} C_{ij}^{MIN} \right)$$

$$YG = YGK + TDHT + TDFT + TPROD + TPRCTS + YGTR$$

$$YG = \sum_k \lambda_{gvt,k}^{RK} \left(\sum_j R_{k,j} KD_{k,j} \right) + \sum_h TDH_h + \sum_f TDF_f + \sum_{l,j} TIW_{l,j} + \sum_{k,j} TIK_{k,j} + \sum_j TIP_j + \sum_i TIC_i + \sum_i TIM_i + \sum_i TIX_i + \sum_{agng} TR_{gvt,agng}$$

$$SG = YG - \sum_{agng} TR_{agng, gvt} - G$$

$$YF_f = YFK_f + YFTR_f$$

$$YF_f = \sum_k \lambda_{f,k}^{RK} \left(\sum_{ij} R_{k,j} KD_{k,j} \right) + \sum_{ag} TR_{f,ag}$$

Equilibrium in Commodity and Factor Markets

$$Q_i = \sum_h C_{i,h} + CG_i + INV_i + VSTK_i + DIT_i + MRGN_i$$

$$\sum_j LD_{l,j} = LS_l$$

$$\sum_j KD_{k,j} = KS_k$$

$$IT = \sum_h SH_h + \sum_f SF_f + SG + SROW$$

$$\sum_j DS_{j,i} = DD_i$$

$$\sum_j EX_{j,i} = EXD_i$$