

Estimation of the Economic Opportunity Cost of Labor: An Operational Guide for Mozambique

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ABSTRACT

Using the supply price approach, the economic opportunity cost of labor (EOCL) was estimated for a number of labor market situation in Mozambique. The (EOCL) varies by skill, location, and labor market. The approach presented in this paper incorporates these factors in the estimation process. Due to the influence of diverse labour market conditions at the time of project implementation one is not able to provide a single estimate of the EOCL that can be used in the evaluation of all projects. Instead our objective is to develop an operational framework with examples that will serve as a guide for the estimation of the EOCLs across a range of circumstances typical to Mozambique. Our findings indicate that the range of the EOCL in Mozambique can vary from near equality with the project wage for unskilled workers to about 63% of the project wage for foreign-sourced skilled workers. These rates depend heavily on location and on the highly-differentiated skills of the labor employed and, most importantly, the wage paid by the project relative to the minimum wage required (the supply price) to attract sufficient workers with the required skills. Similarly, the consideration of the international mobility of workers further enriches this analysis.

Keywords: Economic Cost, Labor, Supply Price, Protected Wage, Investment Appraisal

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1. Introduction

Job creation is of the utmost importance to governments. The economic benefit of a project's employment impact is correctly measured by the amount that its wage bill exceeds the economic opportunity cost of the labor (EOCL) employed. Estimating the EOCL is more challenging than estimating the economic cost of a homogeneous commodity or service. Labor services are heterogeneous across occupations, skills, working environments, labor market conditions, and regions. Hence, the EOCL will also vary across these parameters. The challenge we face is to estimate this parameter in a manner that is operational, with an acceptable degree of accuracy. In this paper, we provide a guide to the estimation of the EOCL for a range of labor market types applicable to Mozambique.

The EOCL is a critical calculation in project evaluation because of the role it plays in determining the value of the labor externality (LE) associated with a project. A LE exists when the total labor compensation (W_p') differs from the EOCL of the labor employed by the project. We write the LE as:

$$LE = W_p' - EOCL \quad (1)$$

A positive LE means that a project pays workers more than their opportunity cost on the project. The magnitude of this externality depends on a number of variables including the supply conditions of the type of labor being employed. As our analysis will show, additional variables such as social security programs, income taxes, and union monopoly power need to be taken into consideration. A characteristic of this labor externality is that it may be split between labor and the government.

Section 2 describes the structure of the labor markets in the country. Section 3 describes the methodology we employ in this guide and discusses its associated advantages. Section 4 illustrates seven cases involving domestically-sourced labor relevant to Mozambique and the employment of foreign labor using this framework and presents estimates of the EOCL in each case. Section 5 concludes. Accompanying this paper is an Excel model that will allow the project analyst to estimate the value of EOCL for the specific type of labor employed.

2. Labor Markets in Mozambique

The economy has, traditionally, been agriculture-based and largely informal. Though this is still largely true today, considerable growth has occurred in other sectors, including the public sector, over the past two decades. Much of this growth has occurred alongside the expansion of the mining and natural gas industries. The manufacturing sector also represents a sizable portion of economic activity. Similarly, the economy has modernized considerably with complimentary growth in the financial sector, telecommunications, and services. Additionally, the population has grown over this period, and this trend is projected to persist. While much of the population is still employed in agriculture, recent economic growth has brought a diversity of employment opportunities (World Bank, 2017).

The labor market in Mozambique, like many less developed countries, is characterized by high rates of internal rural-urban migration. While the majority of the population is still concentrated in rural areas, the country has experienced rapid urbanization, as individuals move to urban areas to work in the growing modern sectors and to take advantage of public services.

It has also been common in Mozambique for certain groups of workers to work outside of the country, incentivized by higher wages and a greater diversity of employment opportunities in other countries. Of particular significance in this case is South Africa, which has been the destination for much of Mozambique's emigrant labor for many decades¹.

Despite a large and growing supply of labor in general, the supply of skilled labor in Mozambique is largely constrained by a workforce with low levels of education and skills. As such, it is plausible that many projects must rely on foreign labor, for a significant period of time at least for their construction phase. In light of the above, this report focuses on several cases which illustrate how the EOCL should be estimated in each of these environments. We turn now to a discussion of our methodology.

3. Methodology

There are two theoretical approaches to estimating the EOCL. The first begins with an estimation of the value of the marginal product of labor foregone if workers work on the project being evaluated instead of some alternative job². The second approach is via the supply price of labor which starts with the gross of tax market wage that is needed to attract workers to the project³. In this analysis, we employ the latter approach as it is, in general, more straightforward and applicable across varying labor market conditions. It also has less stringent data requirements.

When employing the supply price approach, we first consider the gross of tax wage that employers need to pay in order to obtain sufficient workers of a particular skill. This variable is also generally well-known amongst employers operating in the region of the project. It is the net of tax wage, however, that potential employees are responding to when choosing to work on the project or not. An advantage of this approach is that the net of tax supply price already captures the worker's preferences for location, working conditions, and other idiosyncratic factors which may affect their decision to work on the project. From the perspective of the individual, this price reflects the economic cost of supplying labor to the project.

The marginal product foregone approach would require the project analyst to estimate the monetary values of each of the components individually and accordingly adjust the foregone wages for the equalizing differences in well-being and costs as valued by the worker between the employment and living conditions of the alternative employment situations facing the potential project employee. This generally cannot be done with an acceptable degree of accuracy, given the time constraints associated with the appraisal of the project.

If a project hires labor, we should expect that some people who are already employed in other places will move to the project. These workers will migrate to the project if the project wage is at least as large as their required supply price. This labor market adjustment will decrease the quantity supply of labor supplied in the alternative labor markets. It is important to note that, if a labor market is characterized by a high level of unemployment, this fact would tend to lower the supply price (gross of tax wage) that the workers would require before offering their labor services to the project. The opposite is also the case

1 Castel-Branco, Carlos Nuno. "Economic Linkages between South Africa and Mozambique." Unpublished Research Paper. London: UK Department of International Development (2002).

² Little, I. M., & Mirrlees, J. A. (1974). *Project appraisal and planning for developing countries*. New York, Basic Books.

³ Harberger, A.C., *Project Evaluation: Collected Papers*, (Chicago: The University of Chicago Press, 1972), Chapter 7.

when a particular labor type is in short supply. Here we would expect to find that the supply price of this type of labor will rise.

Once the gross of tax supply price (wage) for the project is determined, it is adjusted to account for the various distortions present in the labor market. It is critical to incorporate all the relevant distortions to accurately estimate the EOCL.

These distortions arise from the presence of income taxes, social security contributions, employment insurance, labor union monopoly power, enforced minimum wage laws or any other type of tax or subsidy present in the project's labor markets. Furthermore, when workers move from an alternative job to work on the project, they will take into consideration the net of tax wage they are giving up and the minimum net of tax wage they must receive in order to be willing to work for the project. If they are paying taxes on the wages they earn in their alternative employment they will not consider these taxes lost as a loss in economic welfare.

While the reduction in tax revenues from the reduction in employment is not in itself an economic welfare loss, however, the worker must have been generating a value of a product in the alternative employment large enough so the employer is willing to pay a gross of tax wage sufficient for the employee to earn his/her supply price for that job and at the same time be able to pay the tax on these wages. This component of the value of the marginal product of labor that serves to cover the cost of these taxes is an economic loss that the worker does not consider when moving to the project from alternative employment. Hence, two adjustments need to be made to the gross of tax supply price associated with the project. First, a subtraction must be made of the tax component of this supply price for the project site, and an addition to an amount that is measured by the taxes no longer paid where a worker moves from the alternative place of employment.

When a project hires additional employees, it is natural that some new workers may represent new entrants to the formal labor force in response to the improved labor conditions created by the project. These new entrants will be responding to the opportunity to earn a net of tax wage that will be paid by the project. If there are no taxes or subsidies associated with their prior non-formal market activities, then the gross of tax wage rate reflecting the supply price to the new project only needs to be adjusted by the taxes that will be paid by the new labor force entrant earning this supply price-wage. In the absence of taxation, worker migration for employment on a new project from employment in an alternative market requires no adjustment to drive the EOCL. The supply price captures exactly the lost benefits of the worker in the alternative market.

In summary, when labor markets are competitive, the estimation of the EOCL begins with the gross of income tax supply price of labor; W_g^s for a particular type of labor skill that will be supplied to a specific project at a given location. This wage, W_g^s , reflects the minimum wage that the project would need to offer in order to meet its labor needs. This simple measure captures a number of important factors. For instance, this wage already accounts for the worker's skill level, its preferences regarding location, working conditions, the disutility of moving to the project, time spent away from family or household production, and the alternative employment opportunities available to the person. In a market with no distortions, this supply price wage for a type of labor captures the EOCL as it captures all of these foregone opportunities for the worker. This is, in essence, the advantage of the supply price approach to estimating the EOCL of labor.

3.1. Methodology for Estimation of the EOCL in the presence of taxes and other distortions.

When distortions are present in the labor market, we must adjust the supply price to account for these. The two most common distortions in the labor market are income and social security taxes. Income tax is levied on the growth of income wage received by the employee. Typically, the responsibility for the payment of income tax is on the individual employee. However, the employer might be required to withhold the estimated income tax at the time wages are paid. The tax base for social security tax is also the wage gross of income tax paid by the employer to the employee. However, the amount of this tax is calculated by the employer and paid to the government. From the perspective of the employer, the total employee compensation or payment is the project wage (W_p) plus the social security paid by employer (T_s). These two added together become the total employee compensation $W'_p = W_p(1 + T_s)$.

When the wages are subject to income taxes the EOCL becomes the gross of tax supply price less the income taxes paid by this individual working at this wage plus the income taxes forgone elsewhere in the economy. We can denote the share of the project's labor sourced from currently employed workers as H^d . These workers earn the alternative wage W_g^a . The remainder of the project's labor would be sourced from the informal sector or non-market activities which does not require adjusting for income taxes⁴. In what follows, the degree of distortions in the market is the most relevant factor.⁵ In the case of the presence of distortions, the EOCL is:

$$EOCL = W_g^s - (W_g^s T - H^d W_g^a T') \quad (2)$$

where:

- H^d denotes the proportion of the project's demand for labor obtained from taxed employment in the alternative market.
- W_g^s denotes the gross of income tax supply price of labor.
- W_g^a denotes the gross of income tax wage of labor from alternative sources.
- T denotes the income tax rate plus social security paid by employees ($T_{s1}=3\%$) corresponding to the supply price of labor.
- T' denotes the total effective tax rate including both the income tax rate and the social security taxes ($T_s + T_{s1}$) corresponding to the alternative wage rate.
- T'' denotes the income tax rate plus social security paid by employees ($T_{s1}=3\%$) corresponding to the project wage which is levied on wages in the formal sector.

In equation (4), the supply price of labor is adjusted (reduced) by the income tax rate levied on the wage paid to the project's labor force ($W_g^s T$) and is increased by the income and social security taxes lost from reduced employment in the alternative formal labor market ($H^d W_g^a T'$). In the case of Mozambique, H^d is a particularly important parameter. Because the informal sector makes up such a large portion of economic activity, it may be reasonable to assume that a great deal of labor comes from informal market activities as opposed to alternative formal markets. As such, we would expect a reasonable parameterization of H^d for Mozambique to be lower than for a county where the informal sector is less substantial.

⁴ The tax structure applicable to labor income in Mozambique is detailed in the Appendix.

⁵ Jenkins, Glenn P., and Arnold C. Harberger. Cost-Benefit Analysis of Investment Decisions. www. Amazon.com, 2018.

From equation (4), we can calculate the labor externality associated with a project when distortions are present. We present the general case here and illustrate the calculation of this externality alongside the estimation of the EOCL below. Again, from equation (1), the labor externality is:

$$\begin{aligned}
LE &= W_p' - EOCL \\
&= W_p' - [W_g^s + (W_g^s T - H^d W_g^a T')] \\
&= W_p (1+T_s) - [W_g^s + (W_g^s T - H^d W_g^a T')] \\
&= W_p + W_p T_s - W_g^s - W_g^s T + H^d W_g^a T' \\
&= W_p T'' + W_p (1-T)'' + W_p T_s - [W_g^s (1-T) + H^d W_g^a T'] \tag{3}
\end{aligned}$$

We can interpret each of the terms above as being benefits accruing to labor or taxes gained (+) or lost (-) by the government:

$$\text{Labor benefits} = W_p (1-T'') - W_g^s (1-T) \tag{4}$$

$$\text{Government benefits} = W_p T'' + W_p T_s - H^d W_g^a T \tag{5}$$

4. Economic Opportunity Cost of Labor

We will now employ the supply price of labor approach to cases that are of particular relevance to Mozambique. Firstly, we will focus on estimating the EOCL on rural and urban projects, hiring both skilled and unskilled labor from the domestic labor markets. We will also illustrate the EOCL for the case in which domestic labor can alternatively work abroad. We will then turn to the case of hiring foreign labor, which we assume to be responsive to a shortage of skilled labor in Mozambique. We will illustrate each case analytically, followed by an empirical illustration.

4.1. A Rural Project Employing Domestically Sourced Unskilled Labor

In the simplest case, we examine a labor market with no significant distortions. Suppose a project in a rural region employs unskilled labor at the prevailing market monthly wage rate. In this case, the EOCL is the simple calculation described above. Beginning with the gross of tax supply price of labor, W_g^s , the EOCL is:

$$EOCL = W_g^s \tag{6}$$

Because no distortions are present, the market wage is the supply price that captures all the factors mentioned above and thus reflects the true EOCL for this type of labor. Suppose the approximate monthly market price of unskilled labor in a rural area in Mozambique is 3,642 MZN⁶ and the project is going to pay an amount equal to the supply price of labor ($W_g^s = W_p$). The EOCL is then, simply:

$$EOCL = W_g^s = 3,642 \text{ MZN}$$

Using equation (1) for the estimation of labor externality, the LE associated with this project is:

$$LE = W_p' - EOCL$$

⁶ The minimum wage for agriculture, hunting and forestry in 2017, announced by Diogo in 2017, source (<https://clubofmozambique.com/news/from-3642-to-10400-meticais-per-month-meet-mozambiques-16-new-minimum-wages/>)

However, given that no social security tax rate is present in this case, the W_p' is equal to W_p which results in no LE as shown below:

$$\begin{aligned} &= W_p - W_g^s \\ &= 0 \end{aligned}$$

As can be seen from the above, there is no LE in this simple case. Because no distortions occur in this market, there is no externality generated from the reallocation of labor to employment by the project from other activities. If unemployment is high in the region, then the supply price of labor to the project as reflected by the market wage will be lower than it would be if the incidence of unemployment were less.

An important consideration when determining the EOCL, particularly in agricultural areas as described above, is the extent to which demand and supply factors affect the prevailing market wage for a particular type of labor over the course of the year. This *seasonal variation* in the wage rate for a particular type of labor can affect the EOCL considerably and must be accounted for in the estimation of the EOCL for labor employed for an extended period of time such as one year. The pattern of the seasonal project demand for a particular type of labor also determines the overall EOCL for the project.

Seasonal variation in both the market wage and the labor needs of the project must be accounted for to estimate the EOCL accurately for the entire amount of unskilled labor employed by a project over the year. Equation (3) deals with this matter by expressing the EOCL for a project as the product of the monthly market wage rates (W_t) and the labor demand (L_t) for each season (month), in a location or region over the course of a year. This can be expressed as:

$$EOCL = \sum_{t=0}^n L_t W_t \quad (7)$$

Where t denotes a specific period of time and n denotes the total number of time periods. To illustrate, consider Table 1, which depicts a monthly market wage schedule and labor demand (in person-months) over the course of a year for a particular project. Applying equation (3) to the data in Table 1, the annual EOCL for the project as a whole is:

$$\begin{aligned} EOCL &= \sum_{t=0}^n L_t W_t \\ &= 2761.3 * 10 + 2761.3 * 10 + 2761.3 * 10 + 3106.5 * 5 + \dots + 3106.5 * 3 + 2761.3 * 3 + 2761.3 * 3 = \\ &183,626.8 \text{ MZN} \end{aligned}$$

If a wage rate is paid for all months during the year of 4142 MZN, the wage bill would be $4142 * 60 = 248,520$ MZN. As before, with no social security tax in this case, the $W_p = W_p'$, hence, the LE would be:

$$\begin{aligned} LE &= (W_p * n) - EOCL \\ LE &= ((4142 * 60) - 183,626.8) = 64,893.2 \text{ MZN for the project.} \\ \text{Labor Benefits (LB)} &= (W_p * n) - \sum_{t=0}^n L_t W_t = 248,520 - 183,626.8 = 64,893.2 \text{ MZN per Month} \\ \text{Government Benefits (GB)} &= 0 \end{aligned}$$

This benefit accrues entirely to the labor employed because the project is paying a fixed money wage greater than the supply price of labor in most months and there are no taxes levied on this labor income.

Table 1: Market Wages and Labor Demand for a Project with Seasonal Agriculture

Month	Regional Market Wage (MZN/month)	Labor Demand/person, Month by Project	EOCL of Total Project Labor by Month (MZN)
January	2761.3	10	27613
February	2761.3	10	27613
March	2761.3	10	27613
April	3106.5	5	15532.5
May	3451.6	5	17258
June	3451.6	5	17258
July	4142 ⁷	6	24852
August	4142	0	0
September	3451.6	0	0
October	3106.5	3	9319.5
November	2761.3	3	8283.9
December	2761.3	3	8283.9
Total	-----	60	183,626.8

In the case above, workers do not pay taxes and thus any distortions a tax on labor income would create, are absent from the estimation of the EOCL.

4.2. A Monthly Rural Project Employing Domestically Sourced Unskilled Labor from The Informal Sector to The Rural Formal Sector Jobs (e.g. Mining).

When a worker becomes employed in the formal sector of the economy social security taxes must be paid on the wages they receive. These social security taxes that mount to 7% in total are paid by the employer and employee. The employer pays a tax $T_s = 4\%$ of the wages they pay to the employee. The employee in turn will pay a tax of $T_{s1} = 3\%$, which is deducted from their project wage which the employer also submitted to the government. The analysis will begin with the assumption that the formal sector project pays a competitive wage so that the equation of $(W_p(1 - T_{s1}) = W_g^s(1 - T_{s1}))$ must be valid. As the worker is moving from informal sector to the formal sector, then the social security tax rate T_{s1} was levied on the supply price of labor in the informal sector, hence $(T_{s1} W_g^s)$ is equal to zero. Hence

⁷ The minimum wage in Mozambique with effect from 01-04-2018 to 31-03-2019 for agriculture, livestock, and forestry. For details, see Table A3 in Appendix.

we have $(W_p(1 - T_{s1}) = W_g^s)$. This equation states that the employees net of social security wage they receive is equal to the supply price of labor which in turn is the prevailing market wage in the informal sector. Alternatively, the project wage W_p must be at least equal to $\frac{W_g^s}{1-T_{s1}}$. If the project were to paid less then the workers would be worse off working for the project than working in the informal sector. The cost of this labor to the project will have to include wage rate paid to the employee plus the 4% social contribution that, by law, the employer must pay. For unskilled labor jobs it is assumed that the wage rate is not high enough for the individual to be subject to income tax. Hence, the project wage (employer's cost W_p') is higher than the supply price of unskilled labor for this rural formal project by a total of 7%. In this case, the EOCL= W_g^s , but the LE is equal to $W_p' - \text{EOCL}$. Here the W_p' is equal to $1.04 * W_p$.

If the monthly market wage of unskilled labor in the informal sector (supply price W_g^s) is 7000 MZN, then at least the project wage (W_p) of this unskilled labor in the formal sector is

$$W_p = \frac{W_g^s}{1-T_{s1}} = 7000/1-0.03 = 7,216$$

Then the labor cost to the project is therefore equal to

$$W_p' = 1.04 * W_p$$

$$W_p' = 1.04 * 7216 = 7,505 \text{ MZN}$$

Given that $\text{EOCL} = W_g^s = 7000$ then the LE is:

$$\text{LE} = W_p' - \text{EOCL} = 7,505 - 7000 = 505 \text{ MZN per month}$$

As can be seen from the above, the monthly labor externality generated in this simple case goes to the government in terms of social security tax revenues.

The ratio of the EOCL relative to the total compensation for the employee (W_p') as the conversion factor (C.F) for this specific type of labor. That is, this quantity can be used to convert a project wage to its EOCL. In the above case, the conversion factor is:

$$C.F = \frac{\text{EOCL}}{W_p'} = 7,000/7,505 = 0.93$$

$$\text{The rate of government benefits} = \frac{W_p(T_s + T_{s1})}{W_p(1 + T_s)} = \frac{7,216 * 0.07}{7,216 * 1.04} = 0.07$$

4.2.1. Monthly Wage in Formal Sector Is Greater Than the Prevailing Market Wage Rate

If the monthly wage paid by this formal sector employer is 20% higher than the prevailing market wage rate (supply price), then the W_p is now equal to $7000 * 1.2 = 8,400$ MZN. Accordingly, the total labor compensation (W_p') is equal to $1.04 * 8400 = 8,736$ MZN. The level of income in this case is not high enough to meet the income tax rate, however, we have the social security tax of $T_{s1} = 3\%$ paid by employee.

Given that $\text{EOCL} = W_g^s = 7000$ then the LE is:

$$\text{LE} = W_p' - \text{EOCL} = 8,736 - 7000 = 1,736 \text{ MZN per month}$$

$$\text{LB} = W_p(1 - T_{s1}) - W_g^s = 8400(1-0.03) - 7000 = 1,148 \text{ MZN per month}$$

$$\text{GB} = W_p T_{s1} + W_p * T_s = 8400 * 0.03 + 8400 * 0.04 = 588 \text{ MZN per Month}$$

And the conversion factor in this case is $C.F = \frac{EOCL}{W_p'} = \frac{7,000}{8,736} = 0.80$. In this case, as the level of income is not enough to be subjected to income tax, the income tax rate corresponding to the project wage (T'') is equal to the value of social security tax of 3% paid by employees. In summary, we can see that as the project wage is greater than the supply price of labor, the conversion factor has decreased.

Table 2. Summary Statistics for Rural Unskilled Labor in the Formal Sector

Case	Monthly project wage (W_p)	Monthly supply price of labor (W_g^s)	Total labor compensation (W_p')	Alternative wage rate (W_g^a)	EOCL	$C.F$	$\frac{LE}{W_p'}$	$\frac{LB}{W_p'}$	$\frac{GB}{W_p'}$
Rural, Unskilled, Formal Sector	7,216 MZN	7,000 MZN	7,505 MZN	----	7,000 MZN	0.93	0.07	0	0.07
Rural, Unskilled, Formal Sector	8,400 MZN	7,000 MZN	8,736 MZN	----	7,000 MZN	0.80	0.20	0.13	0.07

4.3. A Rural Project Employing Domestic Skilled Labor with Migration from Other Labor Markets

We now consider the case of a project in a rural area employing skilled labor, where the supply price of skilled labor in this rural (remote) region is likely to be higher than what this labor would have been earning in the alternative urban labor markets for such skilled labor. Most skilled workers will require a wage premium to induce them to work in a rural area over and above what they would earn if living in urban areas. Furthermore, the net of tax wage rate paid by the rural project must be at least as great as the net of tax supply price of this labor. In some circumstances, in order to retain enough skilled workers, the project wage may be greater than the prevailing market wage for a particular skill in the location of the project.

When distortions are present in the labor market, we must adjust the supply price wage to account for these. In this case, the EOCL becomes the supply price less the income taxes paid by this individual working at the supply price, plus the income taxes forgone elsewhere in the economy. As a share of the project's labor, H^d will be sourced from employed workers earning the alternative wage W_g^a , perhaps even in another region of the country. The remainder of the project's labor would be sourced from the informal sector or non-market activities, which does not require adjusting for income taxes. As discussed before, in the case of the presence of distortions, the EOCL is:

$$EOCL = W_g^s - (W_g^s T - H^d W_g^a T') \quad (8)$$

From equation (4), we can calculate the labor externality associated with a project when distortions are present. We present the general case here that illustrates the calculation of this externality alongside the estimation of the EOCL below. Again, from equation (1), the labor externality is:

$$\begin{aligned}
 LE &= W_p' - EOCL \\
 &= W_p' - [W_g^s - (W_g^s T - H^d W_g^a T')] \\
 &= W_p T'' + W_p (1-T'') + W_p T_s - [W_g^s (1-T) + H^d W_g^a T'] \quad (9)
 \end{aligned}$$

As discussed in the methodology section, using the equations (4) and (5) provide the benefits to labor and to the government such that:

$$\text{Labor benefits} = W_p (1-T'') - W_g^s (1-T)$$

$$\text{Government benefits} = W_p T'' + W_p T_s - H^d W_g^a T'$$

As the supply price of labor, W_g^s is above the alternative wages W_g^a earned elsewhere by this class of labor. For this illustrative example, we assume W_g^a to be 55,578 MZN or 80% of the supply price for the new project per month. In this case, the focus is on a specific subset of skilled labor, which we call professional services. We will assume the supply price for professional labor for the project (W_g^s) is, say, 69,472⁸ MZN monthly, gross of tax and social security contributions⁹. In addition to this, the supply price of labor (W_g^s) net of all taxes must be equal to the project wage (W_p) net of income and the social security taxes paid by the employee. This will be the lowest wage the project can pay and expect to get skilled labor to work for them. Incorporating the effective income tax rate and social security contribution rates described in the appendix, this individual would pay an income plus social security tax rate (T'') of 13.08% on the project wage while the tax rate corresponding to the alternative wage rate (T') is 13.82% and the income tax rate of the supply price of labor (T) is 13.08%. Hence, the relationship will hold that in this case $W_p (1-T'') = W_g^s (1-T)$. Therefore, the total employee compensation (W_p') is equal to $[W_p (1+T_s) = 69,472 * 1.04 = 72,251 \text{ MZN per month}]$. We again assume that $H^d = 0.9$, given the relative tightness of the skilled labor market. The EOCL can then be estimated as, from equation (2):

$$\begin{aligned}
 EOCL &= W_g^s - (W_g^s T - H^d W_g^a T') \\
 &= 69,472 - (69,472 * 0.1308 - 0.9 * 0.1382 * 55,578) \\
 &= 67,295.2 \text{ MZN per month}
 \end{aligned}$$

As discussed before, the conversion factor is calculated by the ratio of the EOCL to total employee compensation (W_p'). In the above case, the conversion factor for labor when the project pays a wage equal the gross of tax supply price adjusted for the social security tax is $67,295.2 / 72,251 = 0.93$.

$$\text{The total labor externality } LE = W_p' - EOCL = 72,250.88 - 67,295.2 = 4,955.68$$

from equations (4) and (5), we can calculate the benefits of the labor to the project and to the government, and thus the magnitude of the labor externality:

$$\text{Labor benefits} = W_p (1-T'') - W_g^s (1-T)$$

⁸ Domingos Julio Langa, Teodato de Alegria Pinto Uqueio, (2016), Estudo Sobre Salarios Em Mocambique Salary Survey, ISCOS p27.

⁹Based on the average salary reported for Big Constructions Architect in 2017/2018, source: <https://www.averagesalariesurvey.com/mozambique>

$$= 69,472 (1 - 0.1308) - 69,472 (1 - 0.1308)$$

$$= 0 \text{ MZN}$$

$$\text{Government benefits} = W_p T'' - H^d W_g^a T' + W_p T_s$$

$$= 69,472 * 0.13 - 0.9 * 0.1382 * 55,578 + 69,472 * 0.04$$

$$= 4,955.68 \text{ MZN}$$

The sum of these two quantities is, by definition, the total labor externality:
 LE = 4,955.68 MZN / month.

In this case, as it is assumed that the supply price of labor (W_g^s) is equal to the project wage (W_p) the labor benefits are equal to zero and therefore, the entire labor externality accrues through increased tax revenue to the government.

4.3.1. The project wage (W_p) is greater than the supply price of labor (W_g^s)

Now suppose that the project wage (W_p) is substantially above the supply price of labor (W_g^s). Let us assume that the project wage is, say, 20% more than the supply price of labor for workers being employed by the project. Hence, we have $W_p = W_g^s (1 + 0.2) = 69,472 * 1.2 = 83,366 \text{ MZN}$. Accordingly, the total employee compensation must include the social security tax and is equal to ($W_p' = 83,366 * 1.04 = 86,700.64 \text{ MZN}$).

The income tax plus the 3% social security rate (T'') corresponding to the project wage is estimated to be 15.57%, while these combined rates of income tax plus the social security for the supply price of labor (T) is 13.08% and the T' which is tax rate (income tax plus 7% social security) corresponding to the alternative wage as before is 13.82%. Using these statistics in the example above, the EOCL can then be estimated as,

$$EOCL = W_p' - (W_g^s T - H^d W_g^a T')$$

$$= 86,700.64 - (69,472 * 0.1308 - 0.9 * 0.1382 * 55,578)$$

$$= 67,295.20 \text{ MZN per month}$$

Accordingly, the conversion factor is $67,295.20 / 86,700.64 = 0.78$ with a total labor externality of 19,405.44. Similarly, using the equations (4) and (5) provide the labor and the government benefits such that:

$$\text{Labor benefits} = W_p (1 - T'') - W_g^s (1 - T)$$

$$= 83,366 (1 - 0.1557) - 69,472 (1 - 0.1308)$$

$$= 10,003.68 \text{ MZN}$$

$$\text{Government benefits} = W_p T'' - H^d W_g^a T' + W_p T_s$$

$$= 83,366 * 0.1557 - 0.9 * 0.1382 * 55,578 + 83,366 * 0.04$$

$$= 9,401.76 \text{ MZN}$$

Hence, the total labor externality is
 LE = 10,420.46 + 8,336.51 = 19,405.44 MZN per month

Table 3. Summary Statistics for the Rural Skilled labor in a Formal Sector

Case	Monthly Project wage (W_p)	Monthly Supply price of labor (W_g^s)	Total Labor Compensation (W_p')	Alternative Wage Rate (W_g^a)	EOCL	C.F	$\frac{LE}{W_p'}$	$\frac{LB}{W_p'}$	$\frac{GB}{W_p'}$
Rural, Skilled, Formal Sector	69,472 MZN	69,472 MZN	72,251 MZN	55,578 MZN	67,295.2 MZN	0.93	0.07	0	0.07
Rural, Skilled, Formal Sector	83,366 MZN	69,472 MZN	86,701 MZN	55,578 MZN	67,295.2 MZN	0.78	0.22	0.12	0.10

4.4 An Informal Urban Project Employing Locally Sourced Unskilled Labor at the Supply Price

In our analysis of the EOCL for workers employed in the informal sector of an urban economy we recognize that there is a close relationship between the labor market conditions of the urban areas and those of the rural economy. Migrants move into the urban sector from the countryside as the demand for labor grows in the urban sector. Because the cost of living, particularly transportation costs, are substantially higher for informal sector workers located in the urban areas, it is expected that the market wage (the supply price) for unskilled labor in the urban area will be substantially greater than the wage for comparably unskilled workers in the rural parts of the country.

In this case also first we assume that the project pays a wage equal to the prevailing market wage which is equal to the labor supply price ($W_p = W_g^s$). Since these unskilled workers are employed in an informal sector job there will be no social security contributions levied on the gross of income tax wage W_p . Moreover, for unskilled labor jobs it is assumed that the wage rate is not high enough for the individual to be subject to income tax. Hence, the project wage (employer's cost W_p') is also equal to the project wage (W_p).

However, there are usually negative externalities or fiscal costs associated with the resulting rural-urban migration that the unskilled informal sector workers do not pay for. These negative externalities may include increased congestion of public services and transportation, additional crime and resulting security costs, pollution and health services.¹⁰ These pose real additional costs on society or the government that should be reflected in the EOCL. In our example, we account for these external costs in a simple way as a percentage K of the gross tax wage bill. In

¹⁰ Byerlee, Derek. "Rural-urban migration in Africa: Theory, policy and research implications." International Migration Review 8.4 (1974): 543-566.

the example below, we assume that this negative externality is equal to 0.06^{11} of the prevailing urban market wage for unskilled labor. In this case, the $EOCL = W_g^s + K * W_g^s$, and the LE is equal to $W_p - EOCL$.

If the monthly market wage (supply price) is 10,000 MZN, the labor cost to the project is therefore equal to

$$W_p' = W_p = 10,000 \text{ MZN}$$

$$EOCL = 10,000 + 0.06 * (10,000) = 10,600 \text{ then the C.E is: } 10600/10,000 = 1.06$$

$$LE = W_p - EOCL = 10,000 - 10,600 = -600 \text{ MZN}$$

This amount of externality is incurred as a fiscal cost by the government.

Table 4. Summary Statistics for the Urban Unskilled labor in Informal sector.

Case	Monthly Project wage (W_p)	Monthly Supply price of labor (W_g^s)	Total Labor Compensation (W_p')	Alternative Wage Rate (W_g^a)	EOCL	C.F	$\frac{LE}{W_p'}$	$\frac{LB}{W_p'}$	$\frac{GB}{W_p'}$
Urban, Unskilled, Informal Sector	10,000 MZN	10,000 MZN	10,000 MZN	---	10,600 MZN	1.06	-0.06	0	-0.06

4.5. A Formal Urban Project Employing Locally Sourced Unskilled Labor at the Supply Price

Suppose now we have a project in the formal sector in an urban area. This project requires unskilled labor and pays the required social security tax to the government and deducts the portion of the social security tax levied on the worker's wages that is also paid to the government. For this type of labor, the minimum wage that can be paid to attract workers to this project must be such that the amount net of social security tax at least equal to the supply demanded by these workers. If the monthly supply price of labor in the urban area $W_g^s = 10,000$ MZN then the competitive monthly project wage must be $W_p = \frac{W_g^s}{1 - T_{s1}} = 10,000 / (1 - 0.03) = 10,309.28$ when there is no income tax to be paid on these worker's monthly wage.

Unskilled labor is not in short supply in Mozambique, hence, we should expect migration to occur from the rural areas for this type of labor. Hence, additional urban sector jobs will be sourced over time by an

¹¹ Michaud, P. C., & Vencatachellum, D. (2003). Human capital externalities in South Africa. *Economic Development and Cultural Change*, 51(3), 603-628.

equal inflow of migrants from the countryside. No income or social security taxes will have been paid by this labor in the informal rural labor markets. However, similar to the above case there are usually negative externalities associated with the resulting rural-urban migration that they do not pay for. Similar to the above case we assume that this negative externality is equal to 0.06 of the prevailing market wage (supply price) for unskilled labor in the urban sector. In addition, the assumed annual wage rate is not taxable (for details see: Appendix) hence, there is no income tax and the total effective tax rate is equal to the social security tax rate ($T_s = 0.04$). Therefore, the EOCL is expressed as:

$$\begin{aligned} EOCL &= W_g^s + W_g^s K \\ &= 10,000 + (10,000 * (0.06)) \\ &= 10,600 \text{ MZN} \end{aligned}$$

As the $W_p' = W_p (1 + T_s) = 10,309.28(1.04) = 10,721.65$ hence the conversion factor is $10,600/10,721.65 = 0.99$. Hence, the labor externality $LE = 10,721.65 - 10,600 = 121.65$. Now we turn to calculation of labor externality and the benefits of the project to labor and to the government:

$$LE = W_p' - EOCL$$

$$LE = W_p (1 + T_s) - (W_g^s + W_g^s K)$$

$$\text{Labor benefits} = W_p(1 - 0.03) - W_g^s = 10,309.28(0.97) - 10,000 = 0.$$

$$\text{Government benefits} = W_p(T_s + T_{s1}) - W_g^s K = (10,309 * (0.04 + 0.03)) - (10,000 * 0.06) = 121.65 \text{ MZN}.$$

Table 5. Summary Statistics for the Urban Unskilled labor in a Formal Sector

Case	Annual Project wage (W_p)	Annual Supply price of labor (W_g^s)	Total Labor Compensation (W_p')	Alternative Wage Rate (W_g^a)	EOCL	C.F	$\frac{LE}{W_p'}$	$\frac{LB}{W_p'}$	$\frac{GB}{W_p'}$
Urban, Unskilled, Formal Sector	10,309 MZN	10,000 MZN	10,721.65 MZN	---	10,600 MZN	.99	0.01	0	0.01

4.6. An Urban Project Employing Locally Sourced Skilled Labor at its Supply Price (prevailing market wage)

We now turn to a case in which an urban project employs local skilled labor at the prevailing market wage in the urban area. Because we are considering skilled labor, which is generally in short supply in Mozambique, we assume that a large proportion of the project's labor will be met by labor that is already employed in alternative markets. As such, we set $H^d = 0.9$. Suppose the monthly gross of income tax supply price of labor (W_g^s) for a typical kind of skilled job, is equal to 55,578 MZN. In order for the project to attract workers it must pay a project wage (W_p), after deducting income and the social security taxes, that is at least equal to the net of all taxes supply price of labor that is demanded by the potential employees. In this case when the tax rates on the project wage are

equal to those implicit on the supply price of labor then the gross of tax project wage be equal the gross of tax supply price of 55,578 MZN. We also assume that the alternative wage W_g^a is 80% of W_g^s which is equal to 44,462 MZN. The effective tax rate (T'') corresponding to the project wage is 9.82%. Moreover, the tax rates corresponding to the supply price of labor (T) and the alternative wage rate are 9.82% and 10.53% respectively.

Given the 4% social security tax rate (T_s), the total labor compensation (W_p') is then equal to 57,578 MZN *1.04 = 57,801.12 MZN. Then, from equation (2), the EOCL is:

$$\begin{aligned} \text{EOCL} &= W_g^s - (W_g^s T - H^d W_g^a T') \\ &= 55,578 - (55,578 * 0.982 - 0.9 * 0.1053 * 44,462) \\ &= 54,331.93 \text{ MZN} \end{aligned}$$

The corresponding labor externality is:

$$\text{LE} = 3,469.19 \text{ MNZ/month}$$

The corresponding conversion factor is $54,331.93/57,801.12 = 0.94$. In this case, the labor and government benefits are:

$$\begin{aligned} \text{Labor benefits} &= W_p (1 - T'') - W_g^s (1 - T) \\ &= 55,578 * (1 - 0.982) - 55,578 * (1 - 0.982) \\ &= 0 \text{ MZN} \end{aligned}$$

$$\begin{aligned} \text{Government benefits} &= W_p T'' - H^d W_g^a T' + W_p T_s \\ &= 55,578 * 0.982 - 0.9 * 0.1053 * 44,462 + 55,578 * 0.04 \\ &= 3,469.19 \text{ MZN/month} \end{aligned}$$

4.6.1 The project wage (W_p) is greater than the supply price of labor (W_g^s)

For example, as before, let us assume that the project wage is 20% greater than the monthly supply price of labor. In this case, the total labor compensation W_p' is

$$W_p = 1.2 * W_g^s = 1.2 * 55,578 = 66,694 \text{ MZN},$$

$$W_p' = 1.04 * W_p = 1.04 * 66,694 = 69,362 \text{ MZN}.$$

As before T is 9.82% and T' is 10.53% but now the income tax plus social security rate of 3% corresponding to the project (T'') is 12.46% accordingly. Using the same value for the alternative wage W_g^a similar to the previous scenario, the EOCL is:

$$\begin{aligned} \text{EOCL} &= W_g^s - (W_g^s T - H^d W_g^a T') \\ &= 55,578 - (55,578 * 0.982 - 0.9 * 0.1053 * 44,462) \\ &= 54,331.92 \text{ MZN} \end{aligned}$$

The corresponding labor externality is:

$$\text{LE} = 15,029.83 \text{ MNZ/month}$$

The corresponding conversion factor is $54,331.92 / 69,362 = 0.78$. In this case, the benefits to labor and government are:

$$\begin{aligned} \text{Labor benefits} &= W_p (I - T'') - W_g^s (I - T) \\ &= 66,694 * (1 - 0.1246) - 55,578 * (1 - 0.982) \\ &= 8,262.12 \text{ MZN} \end{aligned}$$

$$\begin{aligned} \text{Government benefits} &= W_p T'' - H^d W_g^a T' + W_p T_s \\ &= 66,694 * 0.1246 - 0.9 * 0.1053 * 44,462 + 66,694 * 0.04 \\ &= 6,767.71 \text{ MZN/month} \end{aligned}$$

Table 6. Summary Statistics for the Urban Skilled labor in a Formal Sector

Case	Monthly Project wage	Monthly Supply price of labor	Total Labor Compensation (W_p')	Alternative Wage Rate (W_g^a)	EOCL	C.F	$\frac{LE}{W_p'}$	$\frac{LB}{W_p'}$	$\frac{GB}{W_p'}$
	(W_p)	(W_g^s)							
Urban, Skilled, Formal Sector	55,578 MZN	55,578 MZN	57,801.12 MZN	44,462 MZN	54,331.93 MZN	0.94	0.06	0.00	0.06
Urban, Skilled, Formal Sector	66,694 MZN	55,578 MZN	69,362 MZN	44,462 MZN	54,331.93 MZN	0.78	0.22	0.12	0.10

4.7. An Urban Project Employing Local Skilled Labor That to a Degree Would Have Migrated Abroad.

We now turn to an example in which labor is internationally mobile. We assume that the annual salary of such a skilled worker is 900,000 MZN. However, again the supply price of labor (W_g^s) net of all taxes must be equal to the project wage (W_p) net of income and the social security taxes paid by the employee. Hence, the project wage is equal to supply price of wage rate ($W_p = W_g^s$). The effective tax income rate including the 3% social security paid by employee (T'') corresponding to this project is 14.18%.

In this case, an urban project employs skilled labor as before, but the option of labor working abroad is now a possibility. A key aspect of going abroad for employment is that it facilitates the sending back of a stream of remittances, denominated in hard currencies, to relatives or bank accounts in the country.

Although Mozambique has experienced considerable economic growth and diversification over the past two decades, historically, a sizable proportion of workers has gone abroad for better opportunities. We now consider this possibility in the estimation of the EOCL.

When a new project is undertaken domestically, the associated labor can come from two sources. As before, workers may come from alternative employment in other domestic markets, but they can also come from a reduction in international out-migration. The latter group typically sends remittances to their homes and, as such, this is an additional consideration in our calculations. Note that the supply price of labor still incorporates the value of these remittances to the worker. However, there is another relevant distortion here - the foreign exchange premium. This represents a loss of taxes to Mozambique if the worker does not work abroad. Considering this, the EOCL becomes:

$$EOCL = W_g^s * (1 - T) + H^d * W_g^a * T' + H^f * R * W_g^s * (Ee/Em - 1) \quad (5)$$

where:

- H^d denotes the proportion of the project's demand for a given type of labor obtained from taxed employment activities in the domestic market
- H^f denotes the proportion of the project's local demand for a given type of labor sourced from reduced international out-migration
- R denotes the average amount of remittances if this worker were employed abroad
- $(Ee/Em - 1)$ denotes the foreign exchange premium

To estimate the EOCL for returned migrants, we need some additional information. Assume now $H^d=0.7$ and that $H^f=0.3$. In this exercise, we assume that 30 percent of these skilled workers would have migrated to South Africa. Emigrant workers from Mozambique are unskilled and would work in, say, South Africa, in an urban setting at the prevailing market wage. If these retained workers are working in an urban setting in Mozambique, assume their supply price would be the average monthly household income of 75,000 MZN. Hence, the total labor compensation (W_p') is equal to: $75,000 * 1.04 = 78,000$ MZN. We also assume that the gross of income tax wage of labor from alternative sources (W_g^a) is equal to the 80% of W_g^s that is equal to $0.8 * 75,000 = 60,000$ MZN. The total income plus social security tax rates corresponding to the alternative wage rate (T') is 14.79% and the income tax rate including the 3% social security corresponding to the supply price of labor (T) is 14.18%. Finally, assume that $Ee/Em - 1 = 0.06$. The EOCL for returned domestic labor from equation (4) is then:

$$\begin{aligned} EOCL &= W_g^s (1 - T) + H_d * W_g^a * T' + H^f * R * W_g^s * (Ee/Em - 1) \\ &= 75,000 * (1 - 0.1418) + 0.7 * 75,000 * 0.1479 + 0.3 * 0.33 * 75,000 * 0.06 \\ &= 71,020.5 \text{ MZN} \end{aligned}$$

The corresponding conversion factor for retained labor is $77,081.75 / 78,000 = 0.99$. In this case, the entire labor market externality accrues to the government. Labor and government benefits are:

$$\begin{aligned} \text{Labor benefits} &= W_p (1 - T'') - W_g^s (1 - T) \\ &= 75,000 * (1 - 0.1418) - 75,000 * (1 - 0.1418) \\ &= 0 \text{ MZN} \end{aligned}$$

$$\text{Government benefits} = W_p T'' + W_p T_s - H^d W_g^a T' - H^f * R * W_g^s * (Ee/Em - 1)$$

$$\begin{aligned}
&= 75,000 * 0.1418 + 75,000 * 0.04 - 0.7 * 0.1479 * 75,000 - 0.3 * 0.33 * 75,000 * 0.06 \\
&= 6,979.5 \text{ MZN/month}
\end{aligned}$$

Table 7. Summary Statistics for the Urban Skilled labor in a Formal Sector with Abroad Migration

Case	Annual Project wage (W_p)	Annual Supply price of labor (W_g^s)	Total Labor Compensation (W_p')	Alternative Wage Rate (W_g^a)	EOCL	C.F	$\frac{LE}{W_p'}$	$\frac{LB}{W_p'}$	$\frac{GB}{W_p'}$
Urban, Skilled, With Migration Abroad	75,000MZN	75,000MZN	78,000 MZN	75,000 MZN	71,020.5 MZN	0.91	0.09	0	0.09

Economic Opportunity Cost of Foreign Labor

When international migration is possible, there is an additional complication in estimating the EOCL beyond the retention of prospective emigrant workers. Often, large projects requiring skilled labor experience significant shortages of said labor. When international migration is possible (a reasonable assumption in most situations) we would expect for this excess demand to be met, at least in part, by workers migrating internationally to work on the project. Foreign workers pay income taxes and they also may send remittances back to their home country, just as in the other cases we have analyzed. However, the economic opportunity cost of foreign labor (EOCFL) needs to be adjusted downward because of the value added tax levied on the consumption of foreign workers in the host country. Similarly, foreign labor may also be subsidized (N) for a variety of reasons.

4.8. A Project Employing Foreign Labor

The EOCL must further account for foreign exchange rates, additional taxes, and repatriation. We can thus express the EOCFL of foreign labor as:

$$EOCFL = W^f (1 - T_h) - W^f (1 - T_h)(1 - R) t_{VAT} + W^f (1 - T_h) R (Ee / Em - 1) + N \quad (6)$$

where:

- W^f denotes the gross of tax wage of foreign labor;
- T_h , denotes the personal income tax including the social security of 3% paid by employee levied by the host country on foreign labor;
- R denotes the proportion of the net of tax income repatriated by foreign labor;
- $Ee/Em - 1$ denotes the proportion of repatriated income lost via the foreign exchange premium.
- t_{VAT} denotes the VAT rate levied on consumption; and
- N denotes the value of benefits gained by foreign workers from subsidies.

To estimate the EOCFL in Mozambique, we need some additional information. The VAT rate in Mozambique as of 2008 is 17%. We assume $N = 0$. Also, assume that foreign workers will need to be paid 154,210 MZN (W_p) on a monthly basis, hence, the income tax rate including the social security of 3% paid by employee (T_h) is 21.71%. Also, assume those working abroad will repatriate about one third of their net of tax income to their home country. That is, $R = 0.33$.

The EOCL from equation (4) is then:

$$EOCL = W^f (1 - T_h) - W^f (1 - T_h)(1 - R) t_{VAT} + W^f (1 - T_h) R (E_e / E_m - 1) + N$$

$$= 154,210 * (1 - 0.2171) - 154,210 * (1 - 0.2171) (1 - 0.33) * 0.17 + 154,210 * (1 - 0.2171) * 0.33 * 0.06 + 0$$

$$= 109,370.67 \text{ MZN/month}$$

$$LE = (W^f(1 + T_s)) - EOCL = 160,378.4 - 109,370.67 = 51,007.73 \text{ MZN per Month}$$

$$GB = W^f(T_h + T_s) + (W^f (1 - T_h)(1 - R) t_{VAT}) - (W^f (1 - T_h) R (E_e / E_m - 1)) - N$$

$$= (154,210 * 0.2571) + (154,210 * (1 - 0.2171) (1 - 0.33) * 0.17) - (154,210 * (1 - 0.2171) * 0.33 * 0.06 + 0)$$

$$= 51,007.73 \text{ MZN per Month}$$

$$LB = 0$$

Table 8. Summary Statistics for Foreign Labor

Case	Monthly Project wage (W_p)	Monthly Supply price of labor (W_g^s)	Total Labor Compensation (W_p')	Alternative Wage Rate (W_g^a)	EOCL	C.F	$\frac{LE}{W_p'}$	$\frac{LB}{W_p'}$	$\frac{GB}{W_p'}$
Foreign Labor	154,210 MZN	---	160,378.4 MZN	---	109,370.67 MZN	0.68	0.32	0	0.32

Again, the entire amount of the labor compensation of 51,007.73 MZN/month accrues to the Treasury. In this case we are not concerned with the increase in welfare of the foreign workers and hence any net benefit they receive by migrating to Mozambique is not included in an adjustment to the economic welfare accruing to Mozambique because of the project. We can calculate the conversion factor for foreign labor employed in Mozambique as before. This quantity is $109,370.67 / 160,378.4 = 0.68$. The rate of government benefit is 0.32.

Table 9: Estimates of the EOCL in Mozambique. MZN. Monthly.

Case	Project Location	Level of Skill	Source of Workers	Distortions	W'_p	W_p	W_g^s	W_g^a	EOCL	C.F	$\frac{LE}{W'_p}$	$\frac{LB}{W'_p}$	$\frac{GB}{W'_p}$
1	Rural	Unskilled Informal Sector	Local	None	3,642	3,642	3,642	--	3,642	1	0	--	--
2	Rural	Unskilled Formal Sector	Local	Social Security	7,505	7,216	7,000	--	7,000	0.93	0.07	0	0.07
2.1	Rural*	Unskilled Formal Sector	Local	Social Security	8,736	8,400	7,000	--	7,000	0.80	0.20	0.13	0.07
3	Rural	Skilled Formal Sector	Local	Income Tax, Social Security	72,251	69,472	69,472	55,578	67,295.2	0.93	0.07	0	0.07
3.1	Rural*	Skilled Formal Sector	Local	Income Tax, Social Security	86,701	83,366	69,472	55,578	67,295.2	0.78	0.22	0.12	0.10
4	Urban	Unskilled Informal Sector	Local	None	10,000	10,000	10,000	--	10,600	1.06	-0.06	0	-0.06
5	Urban	Unskilled Formal Sector	Local	Social Security	10,721.65	10,309	10,000	--	10,600	0.99	0.01	0	0.01
6	Urban	Skilled Formal Sector	Local	Income Tax, Social Security	57,801.12	55,578	55,578	44,462	54,331.93	0.94	0.06	0	0.06
6.1	Urban*	Skilled	Local	Income Tax, Social Security	69,362	66,694	55,578	44,462	54,331.93	0.78	0.22	0.12	0.10

		Formal Sector											
7	Urban	Unskilled Formal Sector	Retention of Out Migrants	Income Tax, Foreign Exchange, Social Security	78,000	75,000	75,000	75,000	71,020.5	0.91	0.09	0	0.09
8	Urban	Skilled Formal Sector	Foreign	Income Tax, Foreign Exchange, Value-added Tax, Social Security	160,378.4	154,210	--	--	109,370.67	0.68	0.32	0	0.32

*, shows the scenario where the project wage (W_p) is 20% greater than the supply price of labor (W_g^s).

5. Conclusion

Because the population of Mozambique is predominantly rural and characterized by low levels of formal education, the country's labor markets face a surplus of unskilled labor. Much of the employment of unskilled labor is in the informal sector. Because skilled workers are in short supply, labor markets are dependent on foreign labor. Conversely, workers of all skill types in Mozambique often go abroad for employment. For these reasons, the EOCL in Mozambique is not simply the wage associated with a particular project.

Our findings indicate that the range of the EOCL in Mozambique can range from near equality with the project wage for unskilled workers to about 63% of the project wage for foreign-sourced skilled workers. These rates depend heavily on location and on the highly-differentiated skills of the labor employed and, most importantly, the wage paid by the project relative to the minimum wage required (the supply price) to attract sufficient workers with the required skills. Similarly, international mobility of workers can further enrich these calculations. The preceding analysis should serve as an operational guide for estimating the EOCL in Mozambique.

References

- Bicak, H. A., Jenkins, G. P., KUO, C. Y., & Mphahlele, M. B. (2004). An Operational Guide to the Estimation of the Economic Opportunity Cost of Labor in South Africa. *South African Journal of Economics*. 72(5): 1057-1068.
- Byerlee, Derek. (1974) "Rural-urban migration in Africa: Theory, policy and research implications." *International Migration Review* 8.4: 543-566.
- Castel-Branco, Carlos Nuno. (2002) "Economic Linkages between South Africa and Mozambique." Unpublished Research Paper. London: UK Department of International Development.
- De Brauw, Alan, Valerie Mueller, and Hak Lim Lee. (2014) "The role of rural-urban migration in the structural transformation of Sub-Saharan Africa." *World Development* 63C: 33-42.
- Harberger, A.C., (1972) *Project Evaluation: Collected Papers*, Chicago: The University of Chicago Press, Chapter 7.
- Jenkins, Glenn P., Kuo, Chun-Yan, Harberger, Arnold C. (2014) *Cost-Benefit Analysis of Investment Decisions*.
- Little, I. M., & Mirrlees, J. A. (1974). *Project appraisal and planning for developing countries*. Basic Books, New York.
- Michaud, P. C., & Vencatachellum, D. (2003). Human capital externalities in South Africa. *Economic Development and Cultural Change*, 51(3), 603-628.
- World Bank. *Mozambique Economic Update: Making the most of demographic change*. Washington: World Bank Group, 2017.

Appendix – Taxation of Earned Income in Mozambique¹²

Income Determination – Income determination for taxable earned income in Mozambique is very broadly determined. Salaries, wages, bonuses, or any other type of remuneration are subject to income tax. Similarly, any payment made by an employer on an employee’s behalf is also subject to income tax.

Income Tax - The earned income statutory tax rates in Mozambique range from 10 – 32 % over a series of tax brackets. All income up to 42,000 MZN is taxed at the rate of 10%. Upper bounds on the remaining brackets are 168,000 MZN, 504,000 MZN and 1,512,000 MZN, with corresponding marginal tax rates of 15%, 20%, 25%, and 32%. Table A1 illustrates these tax brackets.

Table A1 - Income Tax Brackets and Rates, Mozambique		
Income Bracket	Rate	Deductions
0 - 42,000	10	-
42,000 - 168,000	15	2,100
168,000 - 504,000	20	10,500
504,000 - 1,512,000	25	35,700
1,512,000 +	32	141,540

Foreign Workers - Foreign labor faces a flat earned income tax of 20%.

Social Security - Employees pay 3% of gross salary towards social security contributions and employers pay 4%.

Deductions – In addition to the personal deductions shown in Table A1, individuals can apply the following personal deductions:

- 1,800 MZN for each married or single taxpayer.
- 600 MZN for one dependent, 900 MZN for two dependents, 1,200 MZN for three dependents, and 1,800 MZN for four or more dependents.
- Annual income of MZN 225,000 or less is not taxable.

¹² PricewaterhouseCoopers, (2018/2019) *Worldwide Tax Summaries*.

Table A2 demonstrates the calculation of the total effective tax rates including both the income tax rate and the social security tax rate corresponding to the project wage used in our analysis. We assume two dependents for this household.

Table A2 – Total Effective Tax Rates

Case	Annual Income (MZN) (W_p)	Annual Taxable Income	Annual Income Taxes Paid	Effective Average Income Tax rate	Effective Income Tax rate plus social security of 3 % paid by employee	Total Effective Income and social Security Tax Rates (3% paid by employee plus 4% paid by employer)
1	43,704	-	-	-	-	-
2	84,000*	-	-	-	-	4%
2.1	100,800*	-	-	-	-	4%
3	833,664	608,664	84,066	10.08%	13.08%	17.08%
3.1	1,000,392	775,392	125,748	12.57%	15.57%	19.57%
4	120,000	-	-	-	-	-
5	123,711.36*	-	-	-	-	4%
6	666,936	441,936	45,487.20	6.82%	9.82%	13.82%
6.1	800,328	575,328	75,732	9.46%	12.46%	16.46%
7	900,000	675,000	100,650	11.18%	14.18%	18.18%
8	1,850,520	1,625,520	346,226.40	18.71%	21.71%	25.71%

*, Denotes for the income less than 225,000 MZN the total effective tax rate is just the social security tax rate.

Table A3 - Minimum Wages in Mozambique with effect from 01-04-2018 to 31-03-2019

Industry	Sub Industry	Minimum Wage per Month
Agriculture, Livestock and Forestry		4,142.00
Fishing	Industrial Fishing	5,115.00
	Kapenta Fishing	4,063.00
Extractive Industry	Large Mining Companies	8,262.00
	Quarries, Micro, Small and Medium Enterprises	5,798.00
	Salt extraction industry	5,018.00
Manufacturing	Industrial Sector	6,620.00
	Bakery Sector	4,699.00
Electricity, Gas, and Water	Grandes Empresas	7,796.00
	Pequena Empresas	6,422.00
Construction		5,786.00
Non-financial Services Activities		6,250.00
Financial Services Activities	Banks and Insurance Companies	11,987.60
Financial Services	Micro-finance, micro-insurance and auxiliary activities	10,570.56
Hotel Industry		5,878.00
Public administration, defense, and security		4,255.00

Source: © WageIndicator 2018 - WageIndicator.org