12.1 Introduction

The concept of economic opportunity cost is derived from the recognition that when resources are used for one project, opportunities to use these resources are sacrificed elsewhere. Typically, when workers are hired by a project, they are giving up one set of market and non-market activities for an alternative set. The economic opportunity cost of labour (EOCL) is the value to the economy of the set of activities given up by the workers, including the non-market costs (or benefits) associated with the change in employment (Harberger, 1980).

When determining the EOCL, it is important to remember that labour is not a homogeneous input. It is perhaps the most diverse factor of production in any economy. In this chapter, we will examine how the EOCL is estimated in an economy that contains markets for many different types of occupation, with variations by region and by quality of employment opportunities (e.g., pleasant, unpleasant, permanent, temporary, etc.) that affect the EOCL for a project. The focus is primarily on the conditions and distortions in the labour market; the discussion at this point will not concern the potential impacts that employment of domestic labour might have on the market for savings or foreign exchange.\(^1\)

---

\(^1\) In the evaluation of the EOCL, we do not take into account the potential impact on national savings of changes in the amount of income received by labour. This decision is based on three observations. First, most of the labour hired by a particular project would have been employed elsewhere in the absence
A labour externality \( (LE) \) is created for any project when the economic opportunity cost of labour \( (EOCL) \) differs from the wage rate \( (Wp) \) paid to the labour by the project. This externality can be expressed for a specific type of labour \((i)\) as:

of the project. Second, the overall level of national savings is fundamentally determined by macroeconomic and public sector budgetary conditions. Third, the level of uncertainty surrounding the quantitative estimates of the size of the distortion attributed to savings, and the impact on national savings of labour receiving more or less income from a project, warrants considerable caution. If, however, a particular project is deemed to have a measurable impact on savings, and there is an externality associated with this impact, then the value of this externality should be included in the evaluation of the economic net present value (NPV) of that project. In a similar manner, we do not take into consideration the indirect effects on distorted markets, such as foreign exchange, that are due to the movements of labour from other activities to the project. If the quantitative impact of the indirect effects that occur through the foreign exchange market or any other distorted market is known, the value of this externality should be included in the evaluation of the economic benefits and costs of the project.

Economic Opportunity Cost of Labour
When $LE_i$ is positive, the financial cost of labour will be greater than its economic cost and vice versa. As this analysis will show, the magnitude of this externality is a function of more variables than simply the rate of unemployment in the relevant labour market for this class of workers. It will also depend on other distortions in the labour market, such as taxes, unemployment insurance, and protected labour market segments. Furthermore, it will be affected by the quality of the job created. The magnitude of this externality is one factor that causes the economic performance of a project to diverge from its expected financial outcome.

12.2 Alternative Approaches to Estimating the Economic Opportunity Cost of Labour

In estimating the EOCL, two alternative starting points for analysis may be chosen: a) the value of the marginal product of labour forgone; and b) the supply price of labour. It should be noted that calculating the EOCL using either method will theoretically produce the same result. However, these two approaches have different data requirements, levels of computational complexity, and, hence, different degrees of operational usefulness.

12.2.1 Value of Marginal Product of Labour Forgone

The value of marginal product of labour forgone for labour hired by a project is determined by starting with the gross-of-tax alternative wage ($W_a$) that the labour hired for that project would have earned in its absence. In most cases there will, at any future point in time, be an estimated distribution of the labour activities in the presence of the project and an alternative distribution in its absence. The differences between these two allocations will usually sum to zero, especially if leisure and involuntary unemployment are counted among the relevant
activities. This means that the net reductions in labour allocated to other activities must add up to the amount of employment provided by the project. If one works strictly with forgone marginal product, the EOCL for the project would simply be the weighted sum of the forgone marginal products of labour of all different types sourced from the various activities.

This method is not well adapted for reflecting differences in the underlying working and living conditions that do not directly reduce output elsewhere in the economy (Little and Mirrlees, 1974). Historically, some economists have argued that the value of the marginal product of unskilled agricultural workers in developing countries was zero because it was believed that there was a large surplus of labour in the countryside. However, empirical studies of subsistence farmers have demonstrated that their labour does have a positive marginal value, both in farming and in a variety of other productive activities. Using the assumption that the value of the marginal product forgone is zero when hiring unemployed workers, this approach leads to an underestimation of the EOCL, and the estimate does not reflect the true economic costs of the project using the labour.²

12.2.2 Supply Price of Labour

An alternative method that is based on the supply price of labour is more straightforward and easier to use under a wide variety of conditions (Harberger, 1971). The starting point is the market wage (the supply price) required to attract sufficient people of the required skill level to work on the project. The supply price of labour to a project is the minimum wage rate that the project needs to pay in order to obtain sufficient supplies of labour with the appropriate skills. That wage will account for the workers’ preferences regarding the location, working conditions, or any other factors that affect the desirability of working for the project. For example, if a very high local market wage is required to attract skilled labour to a project where the living conditions are bad,
that wage already includes both the value of the forgone wage and the compensation for the economic costs inflicted by the relatively bad living conditions. Of course, the supply price should be adjusted further to account for other distortions, such as taxes, to arrive at the EOCL. But unlike the marginal product forgone approach, where one must measure both of these components separately, the local supply price directly captures in a combined package the wage and non-wage costs of employing labour on the project.

In practical terms, the supply price of labour can be determined by establishing the minimum wage the project must pay in order to attract an adequate number of applicants to work on the project with an acceptable turnover rate. This can often be done by informally surveying workers near the location of the project or using a more formal assessment of the prevailing wage in that activity. To test whether the wage rate being paid by a project is the minimum supply price, one should compare the number of applications by qualified people with the number of positions available. If the number of acceptable applications per job available is very high, and the turnover rate for the project is abnormally low, it is likely that the wage rate paid by the project is above the minimum supply price. However, if the ratio of qualified applicants to positions available is low, this indicates a fairly tight labour market, and the turnover rate is high for the type of skill required. In this case it can be assumed that the project wage is close to the minimum supply price of labour.

Once the minimum supply price of labour has been determined, the EOCL is calculated by adjusting that value to account for relevant distortions (such as income taxes or subsidies). Care must be taken at this point to ensure that all of the market distortions that drive a wedge between the supply price and the EOCL are properly accounted for when estimating the EOCL for the project. The evaluation of a number of these distortions is covered in the following sections of this chapter.

To compare these two methods of calculating the EOCL, let us consider the example of unskilled farm workers who have decided to move from their jobs cutting sugar cane \((c)\) to work on a new project in a more pleasant place \((o)\), harvesting oranges.

The starting point for calculating the EOCL using the marginal product forgone approach would be the alternative wage on the sugar
cane plantation farms \((W_r)\), while the supply price approach would begin with the market wage for working in the orange groves \((W_o)\). It is assumed that these workers do not pay income taxes or face any other significant distortions in their labour market. Other factors, however, could influence their decision to relocate to the new project. For example, the more pleasant climate of the orange-growing region might translate into a reduced cost of living \((C)\), which would allow the workers to maintain the same level of well-being with lower wages. Another factor might be a preference \((S)\) on the part of workers to work in a more pleasant region.

For the purpose of this example, it is assumed that values of the wage and the other factors are as follows:

\[
\begin{align*}
W_o &= $15.00 \text{ per day}, \\
W_c &= $20.00 \text{ per day}, \\
C_o &= $3.00 \text{ per day}, \\
C_c &= $6.00 \text{ per day}, \\
S_o &= $2.00 \text{ per day (value of the preference for the warmer region)}
\end{align*}
\]

Using the marginal product approach, the EOCL can be calculated for the new project as follows:

\[
EOCL = \text{prior wage} - \text{change in cost of living} - \text{worker preferences} \\
= W_c - (C_c - C_o) - S_o \\
= $20 - ($6 - $3) - $2 \\
= $15.00 \text{ per day}
\]

Using the supply price approach, it is possible to arrive at the same value directly because it is known that the market wage necessary to induce the workers to move to the new project in the orange-growing region \((W_o)\) already accounts for the cost of living difference \((C_c - C_o)\) and the workers’ regional preference for the better climate \((S_o)\). Therefore, the EOCL is simply equal to the market wage in the region where the new job is located:

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EOCL = \( W_o = $15.00 \) per day

This highly simplified example demonstrates that both methods for calculating the EOCL should produce the same result. However, in most circumstances it is difficult to place values upon complex factors such as cost of living differentials and workers’ regional preferences. Uncertainties in the value of those factors make the marginal product forgone approach cumbersome to use when information is scarce. Consequently, the straightforward supply price approach is usually an easier way to determine the EOCL.

12.3 Structure of Analysis in the Labour Market

The analysis of the EOCL presented here is structured around five sets of factors, which are primary determinants of the cost of labour to a project. Labour prices can vary greatly from one project to the next, so the following classifications are used to help to identify which of the determinants may have an effect on the labour costs of the project being evaluated:

- Type of labour (skilled vs. unskilled)
- Regional variations and domestic migration
- Type of job (permanent vs. temporary)
- International migration
- Type of labour market (protected vs. unprotected)

First, an analytical distinction is made between different skills and occupations. Classifying workers into relevant occupational categories is essential because of the enormous heterogeneity of the labour factor. In general, the lower the skill, the greater the likely homogeneity of labour within the skill or occupational category. Estimating the economic opportunity cost of unskilled labour is also made more straightforward by the frequent absence of distortions such as taxation and unemployment insurance in that part of the labour market. The skilled
labour market, on the other hand, displays much greater heterogeneity and is frequently subject to multiple distortions, which must be identified and accounted for in the estimation of the EOCL.

Second, regional migration induced by differences in wages, cost of living, and access to consumer goods and amenities also affects the EOCL for a project. Regional wage differentials are a key consideration in the labour market, where a rise in project employment in an urban setting has as its counterpart reductions in employment in rural areas that are traditional sources of migration. In such cases, distortions in the economy related to that migration must be accounted for when estimating the EOCL.

Third, it may also be necessary to take international migration into account. This includes the case in which the creation of jobs will retain workers who would otherwise have gone abroad or, alternatively, the case in which foreign skilled workers are brought into the country to perform certain services.

Fourth, the estimation of the EOCL for a project must consider whether permanent or temporary employment will be created. Temporary positions in sectors such as tourism and construction lead to greater turnover in the labour market and create conditions for voluntary unemployment. This churning effect in the labour market results in additional costs to the economy, which the EOCL should take into account.

Fifth, the rigidities imposed on the labour market through minimum wage laws, restrictive labour practices, and high-wage policies of state and multinational enterprises in some countries tend to create “protected sectors” in the labour market. In such situations, quasi-voluntary unemployment and seasonal unemployment are common. Under these circumstances the evaluations of the EOCL used by a project should reflect these special labour market conditions.

These five classifications within a labour market provide a framework for analyzing the complex concept of EOCL. In this chapter, the EOCL will be analyzed for the simplest case, i.e., unskilled rural labour. Additional elements will then be brought into the analysis as they are needed in order to estimate the EOCL for progressively more complex cases encountered in the appraisal of actual projects.
12.4 Economic Opportunity Cost of Unskilled Rural Labour

Some well-known growth models of underdeveloped countries have often taken the most extreme interpretation of the marginal product forgone hypothesis by placing a value of zero on the EOCL of unskilled labour in rural areas (Todaro, 1989). As previously explained, those theories rely upon the assertion that because of the large number of unskilled rural workers, there is no economic opportunity cost to filling additional jobs (Marglin, 1979, pp. 10-23). However, there is a lack of empirical evidence for the existence of a surplus of idle rural labour. In fact, research into rural economies provides a persuasive body of evidence indicating that when unskilled workers are not employed in the formal agricultural sector, they spend a large proportion of their time on other productive household and family-farming activities. In this circumstance, the prevailing daily or weekly wage rate (the supply price of unskilled labour) is a reflection of the marginal productivity of this type of activity. Hence, the market wage can be used as an effective measure of the value of the forgone marginal product of unskilled labour (Harberger, 1971).

A series of steps serves as a guide to the estimation process when the supply price of labour approach is used to calculate the EOCL. The first step is to determine the minimum gross-of-tax wage \( W \) needed to attract sufficient unskilled labour to the positions available on the project. The second is to identify distortions in the labour market, such as income taxes or unemployment insurance benefits. The final step is to determine the EOCL by adjusting the market wage to compensate for such distortions.

To demonstrate this process, two cases will be considered. In the first case there are no seasonal variations in either the market wage rate or the demand for unskilled workers. The second example demonstrates the way in which EOCL can be estimated when there are seasonal variations in the market wage rate and in the project’s demand for unskilled labour over the year.

In the first case it is assumed that there are no distortions in the unskilled labour market, i.e., there are no taxes paid by the employer
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(demand side) and no income taxes paid by the worker (supply side). It is also assumed that there are no fluctuations in wages or labour demand over time. It follows that the supply price of labour \((W^s)\) is always equal to the prevailing market wage \((W)\). Since there are no distortions, there is no need to make further adjustments to the market wage to estimate the EOCL. Consequently, the market wage rate for unskilled labour is the supply price of labour, which in turn is the EOCL, as shown in equation (12.2).

\[
EOCL = W = W^s \quad (12.2)
\]

Note that the EOCL is estimated using the market supply price \((W^s)\) rather than the project wage \((W_p)\). The project wage is the demand price and measures the financial cost of labour for a particular project, while the market wage measures the opportunity cost to the economy of the unskilled labour. If the demand price is higher than the market wage, the difference is an economic externality that arises from the employment of this type of labour.

In the second case, the estimation of the EOCL of unskilled labour is carried out for a project that demands workers throughout the year, while the market wage varies as a result of demand and supply factors affecting the local labour market. Using the supply price approach, we begin again with the market wage of unskilled labour for this type of project. There are no tax distortions. Owing to the seasonal fluctuations in the market wage, the EOCL at any point in time will be calculated by the market wage rate \((W_t)\) that corresponds to the period of time in which labour is hired by the project.

For example, if a region growing rice and sugar cane has a wage rate of $5 per day during the off-season, it is possible that the wage could be many times higher during the harvesting seasons if these coincide. If a project is built based on the assumption that labour will be steadily available at $5 per day, but instead it must compete for labour at a much higher rate during the harvest season, the financial and economic viability of the project may be threatened.

These higher seasonal labour costs must be accounted for in arriving
at an accurate estimate of the EOCL for a project. Furthermore, seasonal variations in the size of the employed workforce should also be reflected in the calculation of the wage. It is a common condition in rural areas that both the demand for unskilled labour and the market wage rate have pronounced seasonal patterns, as illustrated in Figure 12.1. Equation (12.3) deals with this situation by defining the total EOCL used by a project over a year as the product of the quantity of labour hired in each season or wage period multiplied by the corresponding market wage rate (supply price) for the period. This is equal to the sum of the unskilled wage rate for each particular season or wage period \( (W_t) \) multiplied by the total amount of unskilled labour employed by the project in that period \( (L_t) \):

\[
EOCL = \sum_{t=1}^{n} (L_t W_t)
\]  (12.3)

where \( t \) denotes the period of time and \( n \) denotes the total number of periods.

**Figure 12.1: Effect on the Economic Opportunity Cost of Labour of Seasonal Variations in Wages and Labour Demand in Rural Regions**
where:

\[ \text{Pattern of project’s demand for labour during the year} \]
\[ \text{Pattern of wage rate for unskilled labour during the year} \]

If the project’s demand for labour is relatively high in the off-season, the total EOCL will be lower than if the project’s demand for labour coincides with the seasonal peak demand for this labour.

Consider the case of a labour-intensive sugar project. The project requires unskilled workers on a temporary basis and pays a wage of $180 per month \( W_p \). The working conditions are identical to those prevailing in the labour market. Table 12.1 shows the project’s monthly requirements for workers in column (3), and the monthly market wage rates that labour would be willing to work for on this project in column (2).

**Table 12.1: Market Wages and Project Demand for Seasonal Labour**

<table>
<thead>
<tr>
<th>Month</th>
<th>Market Wage ($/month)</th>
<th>Person-Months Required by Project</th>
<th>EOCL for Period ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1)</td>
<td>(2)</td>
<td>(3)</td>
<td>(4)</td>
</tr>
<tr>
<td>January</td>
<td>120</td>
<td>18</td>
<td>2,160</td>
</tr>
<tr>
<td>February</td>
<td>100</td>
<td>18</td>
<td>1,800</td>
</tr>
<tr>
<td>March</td>
<td>180</td>
<td>18</td>
<td>3,240</td>
</tr>
<tr>
<td>April</td>
<td>180</td>
<td>9</td>
<td>1,620</td>
</tr>
<tr>
<td>May</td>
<td>100</td>
<td>9</td>
<td>900</td>
</tr>
<tr>
<td>June</td>
<td>150</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

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3 Examples are based upon work done by Jenkins and El-Hifnawi (1993).

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In this case, the monthly market wage rates are the supply prices of unskilled labour to the sugar project. Using equation (12.3), the EOCL is then calculated as follows:

\[
EOCL = \sum_{t=1}^{12}(L_tW_t)
\]

\[
= 120 \times 18 + 100 \times 18 + \ldots + 150 \times 9 + 180 \times 9
\]

\[
= 12,690
\]

The project wage \(W_p\) paid does not play a direct role in the estimation of the EOCL. The wage paid by the project is the financial cost to the project. The difference between the financial cost and the EOCL is the value of the labour externality.

### 12.5 Economic Opportunity Cost of Skilled Labour

Skilled labour is not a homogeneous factor, nor are the financial cost and the EOCL going to be the same for all types of such labour. There is no doubt that securing adequate supplies of labour with the appropriate skills is a key determinant of the success of most projects. Post-evaluations of development investments have demonstrated that projects are often seriously delayed or even abandoned because of an inadequate supply of labour with specific skills. Hence, special attention needs to be
paid to determining the sources of supply, levels of compensation, and potential distortions in these labour markets.

To meet a project’s requirements, labour is often induced (with higher wages and a better living environment) to migrate from other areas. For example, skilled workers in urban areas are able to obtain many goods and services, such as better education for their children, that are more readily available in the city. If called upon to move from an urban to a rural area, they may well require a wage premium to be paid, in spite of the fact that simple food items are cheaper in the countryside.

The supply price approach for determining the EOCL for skilled occupations follows the same basic procedure as the unskilled case. The first step is to determine the market supply price of labour ($W^s$) needed to attract workers to the project. Distortions to that wage are then identified and quantified. The EOCL can be estimated by adjusting $W^s$ to account for those distortions.

To demonstrate this approach, the EOCL is estimated for three situations. The first example is simplified by using the somewhat unrealistic assumptions that there are no distortions in the market for labour and that the project provides jobs with the same working conditions as other employers of these occupations in the area. Furthermore, no workers need to (or can) be attracted from outside the area. The second case drops these assumptions and considers a situation in which labour must be induced to move from alternative projects or regions where there are market distortions. The final case is one that demonstrates how employment that lasts for less than a full year can be a factor in determining the value of the EOCL of any particular type of skilled labour.

12.5.1 Labour Market Without Distortions or Regional Migration

If there are no distortions in the market, such as income tax on the wages for a given occupation, and if the employment provided by the project has the same working conditions as alternative employment in the region, it does not matter whether the new workers come from other employment (reduced demand) or from non-market activities (new
Economic Opportunity Cost of Labour

In both cases, the EOCL is equivalent to the local market wage (\(W\)), which is the supply price (\(W^s\)).

This is exactly the same result as in the case of the unskilled rural labour. In fact, the analysis of the EOCL is differentiated not so much by the skill level of the worker as by the nature of the distortions in the labour market. In the case of skilled occupations, it is more realistic to assume that a higher wage will have to be paid to attract such labour away from other jobs that have different working conditions and/or are located in other regions that have distorted labour markets.

12.5.2 Workers Migrate to Project from Distorted Regional Labour Markets

Suppose a project hires labour and some of the workers are induced to migrate from alternative employment in other labour markets. For each occupational type, the project pays a wage equal to or higher than the gross-of-tax supply price (\(W^s\)) to attract an adequate number of workers. As demonstrated by Figure 12.2, the migration of workers from the other regions to the project will shift the labour supply curve leftward to the new position \(SS'\) from \(SS\). This shift intersects the demand curve (\(DD\)) at the higher equilibrium wage rate at \(B\) from \(A\), causing a decrease in the demand for the current employment from \(Q_0\) to \(Q_2\).

At the same time, the higher wage rate may induce some skilled workers to enter the formal labour force, or may result in more overtime being worked, thereby increasing the quantity of skilled labour supplied from \(Q_1\) to \(Q_2\). The net effect is that even if all of the labour for the project migrates from the sending regions, a proportion of the labour \(H_s\) ultimately comes from the newly induced supply, and a proportion \(H_d\) comes from the reduced demand for workers elsewhere.\(^4\)

\(^4\) For a further development of some of these issues, see Bell (1991) and Gemmel and Papps (1991).
Figure 12.2: Regional Interaction among Skilled Labour Markets

The reduction in the quantity of labour employed elsewhere (i.e., \( Q_0 - Q_2 \)) results in a loss of personal income taxes to the government, and this is shown as the area bounded by \( ABCE \); this is also the same as the area measured by the vertical difference between the gross-of-tax supply curve, \( SS \), and the net-of-tax supply curve, \( S_nS_n \), multiplied by the change in employment \( Q_0 - Q_2 \). When calculating the EOCL, only the tax loss resulting from the reduced demand \( (H_d) \) need be accounted for because it is assumed that the increased supply \( (H_s) \) of labour is

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coming from market or non-market activities where there are no taxes or other distortions. Thus, the EOCL for the project in such cases is the gross-of-tax supply price \( W^s \) of workers induced to move to the area minus the difference between the income taxes the workers would pay on this gross-of-tax supply price of labour \( W^s T \), which are gained by the government, and the income taxes previously paid by the workers in their alternative employment \( W^s T \), which are lost by the government. For simplicity’s sake, it is assumed that the tax rates these workers pay on the supply price and alternative wage in the sending region are the same, although this is not necessarily the case.

The EOCL of skilled labour hired by the project in the area can be expressed as follows:

\[
\text{EOCL} = W^s - TW^s - TW^s_{\text{H}} - TW^s_{\text{H}}
\]

where:
- \( H_d \) denotes the proportion of the project’s demand for labour obtained from taxed employment activities in the alternative labour market;
- \( W_a \) denotes the gross-of-tax wage of labour from alternative sources;
- \( W^s \) denotes the gross-of-tax supply price of labour; and
- \( T \) denotes the income tax rate levied on workers in all regions.

In this situation, \( H^s = (1 - H_d) \) includes both the supply of labour coming to the region from untaxed market and non-market activities and increases in labour force participation and the number of hours worked. While it is theoretically possible for a project to change the level of labour force participation or the number of hours worked, over the lifetime of a project this effect is likely to be small, depending on the type of skill and the market at the time of recruitment to the project.

Let us consider again the sugar project discussed above. In addition to the unskilled workers hired for the project, the project requires 1,000
person-months of labour in skilled occupations each year. Owing to a shortage of such workers in this region, the project will have to attract them from the urban areas surrounding the region in which the project is located. It is assumed that despite their monthly gross-of-tax salaries \( W_a \) of $900 in the urban area, these workers will not work for the project for less than $1,200 gross of tax \( W^s \). These wage rates reflect the gross-of-tax supply prices of the workers in the two markets, respectively. Suppose there is a policy of encouraging more workers in these occupations to migrate to the rural areas; in this case the project is required to pay a higher salary \( W_p \) of $1,500 per month for such labour, or $300 more than the supply price. All skilled workers pay 20 percent of their wages in income taxes.

Using equation (12.4), we can estimate the EOCL of this labour to the project by determining: a) the taxes to be paid on the supply price of skilled labour for the project and b) the taxes forgone by the workers in their alternative employment.

\[ W^s T = 1,200 \times (0.20) = $240 \text{/month} \]

\[ H^d = 0.90 \text{ and } H^s = 0.10 \]

Let us assume that the supply of labour in these occupations in the economy is relatively inelastic compared with the demand for that labour, and let \( H^d = 0.90 \text{ and } H^s = 0.10 \). Hence, we can anticipate that approximately 90 percent of the project’s labour requirements will ultimately be sourced from the decrease in the quantity of labour employed elsewhere, while the remaining 10 percent of the project’s needs will be met through increased labour force participation owing to the new project’s higher wage. The forgone taxes from the previous employment of the workers are calculated as follows:

\[ H^d W H^s T = 0.90 \times 900 \times 0.20 = $162 \text{/month} \]
Combining those two parts with the supply price, the EOCL of the labour used by the project in this rural area is calculated from equation (12.4) as follows:

\[
EOCL = 1,200 - [(1,200 \times 0.20) - (0.90 \times 900 \times 0.20)]
\]
\[
= $1,122/month
\]

The difference between the EOCL and the project wage represents the value of the project’s labour externality per month of labour employed. Following equation (12.1), the labour externality for the above case can be expressed as:

\[
WHTWGW\pi = T WHT WT WT Wadp
\]
\[
WHTWGW\pi = 1,500 - 1,200 \times (1 - 0.20)
\]
\[
= $240/month
\]

Carrying this analysis one step further, we can determine how these labour externalities are distributed between the workers and the government. The benefits to each can be calculated as follows:

Labour benefits =
\[
= 1,500 \times (1 - 0.20) - 1,200 \times (1 - 0.20)
\]
\[
= $240/month
\]

Government benefits =
\[
= 1,500 \times (0.20) - (0.90 \times 900 \times 0.20)
\]
\[
= $138/month
\]

Thus, of the total of externalities created per month by the employment of labour by a project, the workers will gain an additional $240 per month, while the government will capture $138 per month in additional taxes. The distributional analysis provides a means of evaluating the financial gains and losses affecting groups in the economy other than the owners of the project.
12.6 Economic Opportunity Cost of Labour When Labour is Not Employed Full-Time

In this analysis, workers are not divided between those who are working in the formal labour market and those who are not. Instead, it is postulated that each worker could spend part of each year in non-market activities or unemployment. In this case, workers can expect to be employed in market activities for a proportion \( P_p \) of the year if they work for the project. If they are not associated with the project, they will be employed for a different proportion \( P_a \) of the year. When they are not working in the formal labour market, they will be engaged in non-market activities outside the project or in alternative regions, i.e., \((1 - P_p)\) and \((1 - P_a)\) proportions of their labour force time, respectively.

The gross-of-tax supply price of skilled labour in the area of the project is again denoted as \( W^s \) and the alternative wage, which reflects this labour’s other opportunities, as \( W^a \). From the supply price approach, the EOCL is equal to the gross-of-tax expected supply price for labour \( W^s \), but only working a portion of the year on the project \( P_p \), minus the additional tax payments that the workers would incur if earning their supply price wage \( W^s \) on this project.

This additional tax is the difference between the tax paid on the project \( P_p \) and the tax previously paid in the alternative mix of market activities \( P_a \). The taxes lost in alternative market activities arise because there is a net reduction in employment of this type of worker elsewhere. We assume that workers do not pay taxes on non-market activities. Using the supply price approach, the EOCL of these workers is the expected gross-of-tax supply price less the expected net change in tax payments. It can be expressed as equation (12.5):
Suppose in this case that the alternative wage rate for skilled labour is $W_a = $600/month and the project wage is equal to the gross-of-tax supply price paid to induce labour to move to the project area ($W_p = $800/month). The tax rate on skilled labour in all locations is 20 percent. All of the labour is obtained from alternative employment ($H_a = 1), and the proportion of time employed in the alternative areas is $P_a = 0.8. Assuming that a skilled worker expects to be employed in the project and the project region is $P_p = 0.9$, the EOCL on this rural project would be:

$$EOCL = 0.9 \times 800 - [0.9 \times 800 \times (0.20) - 1.0 \times (0.8) \times 600 \times (0.20)] = 720 - (144 - 96) = $672/month$$

While the financial cost of labour to fill a job (which employs someone for 90 percent of the year) is estimated on average to be $720 ($= P_p W_p$) per month, the EOCL is only $672 per month, or $48 less than the financial cost. This difference is the net tax gain to the government.

We now extend the analysis to examine a scenario in which workers are employed less than full-time in market activities during a typical year. This is especially important in the case of countries with high unemployment compensation payments, such as Canada and the countries of northern Europe.\(^5\) We differentiate between those engaged in full-time employment and those who have a work history

\(^5\) In these countries, the unemployment benefits vary from 55 percent and 75 percent of lost wage in Canada and Sweden, respectively, to as high as 90 percent of the previous daily wage in Finland.

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characterized by a succession of work experiences interspersed with unemployment. Because of their choice of occupation or their level of seniority, people in the permanent (or full-time) employment sector are almost never unemployed. On the other hand, workers employed in temporary sectors such as tourism and construction are in jobs that are not expected to be associated with continuous employment. For this analysis, individuals who are expected to experience periodic spells of unemployment or non-market time are included in the temporary labour force, both when they are working and when they are unemployed.

When evaluating projects, one further issue for consideration is the quality of the jobs being created (Jenkins and Kuo, 1978). Jobs need to be classified by the type of employment they provide. Are the jobs full-time for the entire year (i.e., permanent sector), or will they employ a given worker for only part of the year (i.e., temporary jobs)? Temporary jobs are those that do not retain the workers for a full year but intersperse employment with spells of unemployment or non-market activities. Permanent jobs provide full-time employment all year round.

Identifying the type of employment being created is important because temporary jobs can have a high economic cost when unemployment insurance payments (or other forms of social security) are paid to such workers when they are engaged in non-market activities, including being unemployed (Boadway and Flatters, 1981). Hence, account needs to be taken of unemployment insurance in the appraisal of a project that creates these jobs.

Let us consider first the creation of permanent jobs. When a project creates new permanent jobs, they will generally be filled by individuals already working in alternative permanent sector jobs or other temporary sector jobs; some individuals will be hired who are currently out of the labour force. These proportions are denoted as $H^p_d$, $H^t_d$, and $H^s$, respectively, where $H^p_d + H^t_d + H^s = 1$. For those being sourced from alternative jobs in the permanent sector, there will be an externality arising from the loss in income tax receipts from the reduction of employment in these activities. For those sourced from the temporary sector, there will be a saving in the unemployment insurance being paid to the temporary sector workers when they are unemployed. At the same time, there is a loss of any taxes they would have paid while working.

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For those jobs that are filled by people who were previously out of the labour force, no externalities need to be included. Therefore, the EOCL of a permanent job can be expressed as follows:

\[
\text{EOCL} + \text{Labour}
\]  
(12.6)

where: 
- \(W^s\) denotes the gross-of-tax supply price of labour to the project;  
- \(W_p\) denotes the gross-of-tax wage earned in alternative jobs in the permanent sector;  
- \(W_t\) denotes the gross-of-tax wage earned in the temporary sector;  
- \(P_t\) denotes the proportion of time a temporary sector worker expects to be employed during a calendar year;  
- \(T\) denotes the personal income tax rate;  
- \(f\) denotes the proportion of time an unemployed worker expects to collect unemployment benefits; and  
- \(U\) denotes the unemployment insurance benefits.

In countries where there is no unemployment insurance, such as Indonesia and Vietnam, then \(f = 0\). Equation (12.6a) will then measure the EOCL to fill a permanent job as:

\[
\text{EOCL} + \text{Labour}
\]  
(12.6a)

On the other hand, when a year’s worth of additional employment is created in the temporary sector of a labour market, these workers will be sourced from the permanent sector, from the temporary sector, and from those previously out of the labour force, in the proportions \(H^p_d\), \(H^t_d\), and \(H^s\), respectively. In this situation, suppose \(P_t\) is the proportion of time that any one person actually works in a temporary sector job during
a year. As temporary jobs are created, and people are attracted to them from the permanent sector, these people will experience periods of unemployment and collect unemployment insurance. Each period of labour services sourced from the permanent sector will have associated with it $1/P_i$ individuals and $(1 - P_i)$ periods of unemployment. This will give rise to $(1 - P_i)$ periods of paid unemployment insurance compensation. For labour services sourced from those already in the temporary sector, the loss in taxes will be for the same length of time as the time working on the project, and the amount of unemployed time and unemployment insurance compensation will also be the same as before. The EOCL that relates to a year’s worth of temporary sector jobs will then be equal to:

$$E_{\text{EOCL}} = \left[ \frac{1}{P_i} \right] P_i T_f U P_i T W P H T W + \left[ \frac{1}{P_i} \right] P_i T_f U P_i T W P H T W$$

(12.7)

In the case where the wage rates paid for temporary and permanent jobs are the same, the economic cost of 12 months of temporary jobs would be greater than for a year in a permanent job because of the higher amount of taxes that would be lost and the higher amount of unemployment insurance payments associated with these jobs.

12.7 International Migration and the Economic Opportunity Cost of Labour

Until recently, labour has been considered a non-internationally traded service. However, this is changing as more and more workers are relocating to other countries to sell their skills and services. There are two scenarios: retention, or returned migrants, and foreign workers.

12.7.1 Retained or Returned Migrants

This is particularly relevant for countries such as the Philippines, Egypt,
and Sri Lanka, where large numbers of skilled and semi-skilled workers are regularly employed abroad for substantial periods of time. In such a situation, when a project is created inside the country and additional labour in certain occupations is hired, we would expect to find a part of this labour to be sourced from a reduction in the outflow of international migration. When this occurs, the EOCL must take into consideration not only the adjustment of the demand and supply of labour in the local markets, but also any distortions associated with the retention or return of migrants who would have been employed abroad.

It is quite common for a country’s citizens who are working abroad to send back a stream of payments in the form of personal savings or remittances to relatives. Following the supply price approach to the EOCL, reductions in remittances are not an economic cost as they will be factored into the worker’s supply price to the project. However, an adjustment needs to be made to the supply price because the remittances are made in foreign exchange, in which a foreign exchange premium exists in most countries. Taking into account the adjustments to both the local and the international labour markets, the expression for the EOCL becomes:

\[
EOCL = W_g (1 - T) + H_d W_a T + H_f R \left( \frac{E^e}{E^m} - 1 \right)
\]

(12.8)

where: \( H_d \) denotes the proportion of the project’s demand for a given type of labour obtained from taxed employment activities in the domestic market;

\( H_f \) denotes the proportion of the project’s demand for a given type of labour sourced from reduced international out-migration;

\( R \) denotes the average amount of remittances (measured in local currency) that would have been made per period if this type of worker had been employed abroad; and

\( \left( \frac{E^e}{E^m} - 1 \right) \) denotes the rate of foreign exchange premium as a fraction of the value of the amount that would otherwise have been remitted.
When some of the sourcing of labour for a project is through an adjustment in the international migration of workers, it is recognized that a share of this labour is being sourced from alternative domestic activities \( H_d = 0.6 \) and a share from changes in international flows of labour \( H_f = 0.3 \). Let us also assume that the VAT rate is 15 percent, that these workers would have remitted $500 on average per month, and the foreign exchange premium is 6 percent. Applying equation (12.8), the EOCL is as follows:

\[
EOCL = W_g (1 - T) + H_d W_a T + H_f R \left( \frac{E^e}{E^m} - 1 \right)
\]

\[
= 1,200 \times (1 - 0.2) + 0.6 \times (900) \times 0.2 + 0.3 \times (500) \times (0.06)
\]

\[
= \$1,077
\]

The difference between the EOCL and the project wage represents the value of the project’s labour externality including the premium of foreign exchange that is no longer remitted to the project country.

12.7.2 Foreign Labour

In countries where the labour shortage is particularly acute, it may be necessary to import foreign workers to work on projects. Examples of this practice can be seen in both developing and developed countries where the demand for labour exceeds the supply. Often, foreign workers are brought into the country by corporations or governments to work on projects requiring their skills. In developing countries, this often takes the form of skilled advisers or technical staff, while in developed countries, guest workers or unskilled labourers are imported to fill gaps in the labour pool. There is an EOCL associated with this foreign labour \( EOCL \), which should be included in the project assessment.

\( EOCL \) is the net-of-tax wage paid to the foreign workers plus adjustments to the amount of foreign exchange associated with the repatriated portion, and adjustments to the amount of VAT associated

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with consumption by the foreign workers using the non-repatriated portion of that wage, plus any subsidies the foreign workers may benefit from while in the country. The repatriated portion of the wage should be adjusted to account for the true cost of the foreign exchange to the economy rather than just its market value. This is necessary because the value of the foreign exchange may be distorted. While living in the country, foreign workers have to use a portion of their wage for consumption. The incremental amount of VAT revenue paid as a result of the foreign workers’ consumption in the country should be accounted for as an economic benefit to the country, as the country gains from the local consumption of the foreign workers. At the same time, foreign workers may benefit from government subsidies on a variety of items, such as food, fuel, housing, and health care. The amount of benefit received by foreign labour from those subsidies should be accounted for as an economic cost to the country. The EOCL of foreign labour can be expressed as:

\[
\text{EOCL} = f W^f - f T_h - f t_{\text{VAT}} - f R E^e + f R E^m E^e + f R E^m N
\]

(12.9)

where:  
- \( W^f \) denotes the gross-of-tax wage of foreign labour;  
- \( T_h \) denotes the personal income tax levied by the host country on foreign labour;  
- \( t_{\text{VAT}} \) denotes the VAT rate levied on consumption;  
- \( R \) denotes the proportion of the net-of-tax income repatriated by foreign labour;  
- \( E^e \) denotes the economic cost of foreign exchange;  
- \( E^m \) denotes the market exchange rate; and  
- \( N \) denotes the value of benefits gained by foreign workers from subsidies.

If \( \text{EOCL} \) is greater than the financial cost of labour to the project, the second term must be smaller than the sum of the third and fourth
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terms; this implies that the economic benefit created by foreign consumption in the country cannot offset the foreign exchange premium related to the remitted portion of the wage and the cost of government subsidies. In this case, the EOCL of hiring foreign labour will be greater than the project wage. However, if the second term is greater than the third and fourth terms, the EOCL of foreign labour will actually be lower than the market wage; this means that the country is benefiting economically from the presence of foreign labour.

Suppose a multinational corporation considers an electronic-assembly project in an urban area and discovers that there is insufficient local labour. It decides to import skilled workers from a nearby country to operate the project until enough local workers can be trained for the production requirements. The shortfall is estimated to be equivalent to 50 workers, who will be paid $2,000 per month. That wage will be subject to a 25 percent personal income tax. Workers are expected to repatriate 30 percent of their net-of-tax income to support family members at home. The VAT rate is 15 percent. The market exchange rate is held constant by the government, while the economic exchange rate is estimated to be 6 percent higher than the market value. In this case, it is assumed that no subsidies are paid by the government with respect to these workers, i.e., \( N = 0 \).

Applying these values to equation (12.9), the EOCL of foreign labour is:

\[
EOCL = 2,000 \times (1 - 0.25) - 2,000 \times (1 - 0.25) \times (1 - 0.30) \times (0.15) + 2,000 \times (1 - 0.25) \times (0.30) \times (0.06) \\
= $1,369.50/\text{month}
\]

This analysis shows that the EOCL of each worker will be $630.50 less than the gross-of-tax wage of $2,000. Hence, a substantial external benefit is generated by this use of foreign labour.

12.8 Effects of a Protected Sector on the Economic Opportunity Cost of Labour

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The focus so far has been on estimating the EOCL in competitive labour markets. In many countries, however, the urban labour market is segmented into a protected sector and an unprotected, or open, sector.\(^6\)

The protected sector is usually made up of the government agencies, foreign companies, and large local firms that provide wages \(W^P\) above the market-clearing wage. The higher wages offered by these types of employers are often the result of stricter compliance with minimum wage laws, powerful unions that are able to demand and receive significantly higher wages, government policies that give higher wages to civil servants, or foreign companies that pay high wages to decrease possible resentment by workers and politicians in the host country. Consequently, employment in the protected urban labour force is highly attractive, with a variety of rationing methods being used to select the people to fill the limited number of positions.

The open labour market is typically affected by fewer distortions to the supply price of labour \(W^O\). Wages are determined competitively in the marketplace, where there are fewer barriers to entry, lower wages, and less security of employment. While workers may be initially attracted to this labour market by the prospect of finding a job in the protected sector, they often end up working in the open labour market.

The phenomenon of chronic unemployment, at rates far in excess of what might be explained in terms of normal friction in the economy, has been attributed, in part, to the existence of a protected labour market. A portion of those chronically unemployed workers are attempting to gain access to the protected sector but, at the same time, are unwilling to work for the lower wages offered by the open labour market. This unwillingness to work for the open market wage creates sub-sectors in the labour market in which quasi-voluntary and search unemployment exists.

\(^6\) The discussion of the EOCL for the protected sector starts from the approach followed by Edwards (1989). See also Bicak et al. (2004).

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12.8.1 The Protected Sector and No Migration

The characteristics of unemployment in this situation are shown in Figure 12.3A. If the overall supply of labour to the market is given by the supply curve \((SS^T)\), the total number of workers making themselves available for work at the protected sector wage of \(W_1^P\) is shown as point \(C\). The number of protected sector jobs available is much more limited at \(Q_p\) (i.e., \(BC\)). Hence, there is an excess supply of labour available at the protected sector wage, as shown by the quantity \(B\). If the selection of workers for employment in the protected sector is carried out in a random fashion from the available workers, independent of their supply prices, it follows that the supply of labour available to the open market will be a fraction \((B/C)\) of the total labour supply \(SS^T\) at each wage rate. This labour supply is shown as the curve \(SS^O\).

To simplify the analysis for this case, it is assumed that the demand for labour in the open sector is perfectly elastic at a wage rate of \(W^O\) and that the intersection of the demand for labour in the open sector \((WD^O)\) with the supply \((SS^O)\) determines the quantity employed in the open market. This quantity is indicated by point \(A^1\). The quantity of labour classified as unemployed \((Q^{O1})\) is determined by the difference between points \(A^1\) and \(B\). These quasi-voluntary unemployed are those workers who will choose not to take jobs in the open market sector because their basic supply price of labour is above the open market wage \(W^O\). They actively seek jobs in the protected sector and will consider themselves involuntarily unemployed. They are seeking work that will pay the protected sector wage \(W_1^P\), but are unable to find it.

If a project is added to the protected sector, then, as shown in Figure 12.3B, the size of the protected sector increases from \((C - B)\) to \((C - B')\). If, again, these additional workers \((B - B')\) are selected randomly from those remaining who want to work in the protected sector, the supply of labour to the open market will shift to the left, from \(SS^O\).
to \(SS^1\). The number of workers willing to take jobs in the open sector will fall from \(A^1\) to \(E\). When workers are attracted from the unemployed and open sectors in proportion to their numbers in the labour pool, in the absence of any distortions, the EOCL of this project is a weighted average of the open sector wage \(W^O\) and the average supply price of the quasi-voluntary unemployed \([(W^O + W^P)/2]\). The relevant weights are the proportions in which workers in each of those categories will be chosen for the protected sector jobs. Under a random selection method, the weights are the fraction of the open sector employment as a share of the total supply of labour not working in the protected sector \((A^1/B)\) and the fraction of the quasi-voluntary unemployed as a share of the total labour force not working in the protected sector, \([(B - A^1)/B]\). Hence, the EOCL for protected sector jobs is given by the expression:

\[
(12.10)
\]

If \(Q^O\) denotes the quantity employed in the open market and \(Q^{OV}\) the amount of quasi-voluntary unemployment before the creation of these additional protected sector jobs, the expression for the EOCL of protected sector jobs can be written as:

\[
(12.10a)
\]

**Figure 12.3: Estimating the Economic Opportunity Cost of Labour for Protected Sector Jobs (One Protected Sector and \(\eta = \infty\))**

\(A\): Before Project
When income taxes are levied on wages in both the protected and the open sectors, the economic cost of hiring workers from the open sector is
the gross-of-tax wage they were earning in the open sector $W^O$, because the taxes on this labour will now be lost. In the case of the quasi-voluntary unemployed hired by the protected sector, their EOCL is still the average of the net-of-tax open and protected sector wages because they pay no taxes when unemployed. To account for these lost taxes, equation (12.10a) can be rewritten as follows:

\[
\frac{Q_{V}}{Q_{O}} = \frac{1}{2} \left( \frac{Q_{V} \cdot O_{Q} + T_{W} \cdot P_{W} \cdot 2}{Q_{O} + P_{W} \cdot 1} \right)
\]

(12.10b)

12.8.2 Two Protected Sectors

It is more realistic to think of the protected sector as containing a series of segmented markets, with different protected sector wages: $W^P_1, W^P_2, ..., W^P$. Figure 12.4A portrays the same labour market as the one dealt with above, with one protected sector. To simplify the analyses somewhat, it is assumed that the demand for labour in the open sector is perfectly elastic. Furthermore, it is assumed that there are no distortions (i.e., taxes or subsidies) in the labour market.

As shown previously, when the first protected sector is introduced at a wage of $W^P_1$, the total number of workers making themselves available for work at the protected sector wage will be given at point $C$. After the jobs in the first protected jobs are filled, the total number of workers employed in the open sector is given by point $A^1$ in Figure 12.4B. Suppose that additional protected sector jobs are then created, where the wage ($W^P_2$) paid is above the open wage but below that of the first protected sector. For the moment, it is also assumed that there are no income taxes. Given the existence of $(C - B)$ jobs in the first protected sector, now a total of $G$ workers would be willing to work in the second protected sector. This is shown in Figure 12.4B by the intersection of the
labour supply curve $SS^O$ and the wage of $W^2_P$.

Figure 12.4: Estimating the Economic Opportunity Cost of Labour for Protected Sector Jobs (Two Protected Sectors and $\eta = \infty$)
The quantities of labour working in the first and second protected sectors are given by \((C - B)\) and \((G - F)\) respectively. With the introduction of the second protected sector, which hires workers in a random fashion from those willing to work at the wage offered, the quantity of workers employed in the open sector falls from \(A^1\) to \(H\). This contraction comes about because some open sector workers are fortunate enough to be selected for a protected sector job. Similarly, the number of quasi-voluntarily unemployed falls from \((B - A^1)\) to \((B - G) + (F - H)\). The quantity of workers \((B - G)\) would be willing to work for the protected wage of \(W^p_1\), but none of this group would be willing to work for anything less than \(W^p_2\). Thus, the quantity of workers \((F - H)\) would be willing to work for a wage of \(W^p_2\), but none would work for the open market wage of \(W^O\).

In these circumstances the EOCL in the second protected sector is the weighted average of the open wage \((W^O)\) for those sourced from the
open sector and the average of the open sector wage and the second
protected sector wage $[(W_2^p + W^O)/2]$ for those sourced from the quasi-
voluntarily unemployed who are willing to work in this sector. The
weights are the number of open sector workers as a share of the total
quantity of labour available at a wage of $W^p_2$ (i.e., $A^1/G$), and the
number of quasi-voluntarily unemployed as a share of the same total
quantity available (i.e., $(G - A^1)/G$). Hence, the EOCL of the second
protected sector jobs can be expressed as:

$$\text{EOCL} = \frac{G}{A^1} \left( \frac{W_2^p}{2} + \frac{A^1}{G} \right)$$

When income taxes are levied on wages in both the protected
and the open sectors, the same adjustment as that made in equation (12.10b)
is needed in order to recognize the loss of income tax revenue from the
net reduction in employment in the open sector when protected sector
jobs are created. Hence, equation (12.11) becomes:

$$\text{EOCL} = \frac{G}{A^1} \left( \frac{W_2^p}{2} + \frac{A^1}{G} - \frac{1}{G} \right)$$

(12.11a)

On the basis of the assumptions used in the above example, similar
expressions can be derived to measure the EOCL for any number of
protected sector jobs, each with their own wage rate. If the total supply
function of labour to the market is a linear function of the wage rate (i.e.,
the quantity of labour supplied at a given wage is $Q = MW$), then
from Figure 12.4B the following relationship can be defined:

As, it follows from the
geometric properties of similar triangles and parallel lines that:

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The EOCL in the first protected sector can be calculated as follows:

$$\text{(12.12)}$$

Likewise, the EOCL in the second protected sector can be expressed as follows:

$$\text{(12.13)}$$

In general, it follows that under these conditions (i.e., linear supply curve and a perfectly elastic demand for labour at the open wage of $W^O$), the EOCL for any protected sector paying a wage $W^p_i$ can be expressed as:

$$\text{(12.14)}$$

The EOCL for any protected sector is simply a weighted average of:

1) the open sector wage $W^O$ and
2) the average of the specific protected sector wage and the open sector wage. The weights can all be expressed as functions of the original total market supply of labour $S^t\{W\}$. 

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When income taxes are levied on wages in both the protected and open sectors, the same adjustment as that made in equation (12.10b) is needed in order to recognize the loss of income tax revenue from the net reduction in employment in the open sector when protected sector jobs are created. Hence, equation (12.15) becomes:

\[
\begin{align*}
    P_i^{\text{TOT OP}} & = \left( \frac{P_i^{\text{TOP}}}{1 + \frac{1}{2} \left( P_i^{\text{TOT P}} - P_i^{\text{TOP}} \right)} \right) \left( \frac{W_{WSC} - W_{WSO}}{1} \right) \\
\end{align*}
\]  

(12.15)

12.8.3 Search Unemployment with No Migration

This analysis of unemployment assumes that all workers, whether they are employed in the open market or are quasi-voluntarily unemployed, have an equal chance of obtaining the protected sector jobs. However, in practice, some workers will have more to gain (by their own assessment) from the protected sector jobs than others and, therefore, can be expected to go to greater lengths to obtain those positions. Some of this extra effort is likely to be reflected in search unemployment, which is a particular type of voluntary unemployment. Search unemployment can be thought of as a category in which the worker voluntarily accepts unemployment with the intention of enhancing the probability of obtaining a protected sector job.

Figure 12.5A depicts a labour market in which search unemployment and the standard type of quasi-voluntary unemployment coexist. We also introduce a less than infinite elastic demand for labour in the open sector \((LD^O)\). The curve \(W^{OS}S^O\) is the supply curve of all those willing to work in the open market. This supply curve has been adjusted for the effect that searching has on the supply of labour available to the open market. The interaction of the demand function for open market workers \(LD^O\) with that supply of open market workers \(W^{OS}S^O\) determines the initial open market wage \(W^O\). The lateral distance between this new
supply curve $W^mS^O$ and the prior supply curve $SS^O$ is the quantity of search unemployment corresponding to any given open market wage. When the wage is $W^m$, the number of workers who opt for search unemployment is equal to the distance $W^mE$, whereas it is the difference between $F$ and $G$ at the open market wage $W^O$. This distance is greatest at wage $W^m$. At this wage, all those not working in the protected sector would prefer to remain unemployed in order to search for protected sector jobs instead of accepting jobs in the open market. As the open market wage rises, fewer and fewer workers are willing to forgo open market earnings in order to seek protected sector jobs until, finally, as the open market wage approaches the protected sector wage $W^p$, the quantity of search unemployment approaches zero.

When additional protected sector jobs are introduced into the protected sector under these conditions, a proportion of the new positions will be filled from each of the three labour pools: search unemployed, quasi-voluntary unemployed, and those currently employed in the open sector. The EOCL will be the sum of the supply price multiplied by the proportions of new hires that come from each of these sectors. Workers who opt for search unemployment are voluntarily accepting a gamble, in which one outcome is to be unemployed and the other is to have a protected sector job. The value of that gamble to them is precisely the open market wage at which they would willingly withdraw from the search process. Therefore, the supply price of the search-unemployed workers $(W^S)$ will be given by equation (12.16):

$$P_1 + P_2$$

where $P_1$ denotes the probability of earning zero income and $P_2$ denotes

---

7 To simplify the analysis, the reaction of the open market wage to the decrease in the workers now available to the open market will be ignored. This analysis is shown in Figure 12.5B.
the probability of finding a protected sector job. $W^S$ will necessarily be higher than $W^O$ because the open market wage is available with certainty, but these individuals refuse to work at this wage in preference to searching for a protected sector job that pays $W^P$.

**Figure 12.5: Estimating the Economic Opportunity Cost of Labour with Quasi-Voluntary and Search Unemployment**
The quasi-voluntary unemployed are unwilling under any circumstances to work at wage $W^O$, requiring a higher wage in order to re-enter the workforce. Workers sourced from quasi-voluntary unemployment for jobs at the protected sector wage ($W^P$) will (with linear supply curves) have a supply price averaging $[(W^O + W^P)/2]$. Finally, the supply price for workers already employed in the open sector will simply be the open market wage $W^O$ because they have already shown a willingness to accept work at that wage rate. Hence, the EOCL for the protected sector project can be estimated by combining those supply prices and the proportions of labour from each sector as follows:

\[
\frac{\sum H^S \cdot W^O + \sum H^{QV} \cdot ((W^O + W^P)/2) + \sum H^O \cdot W^O}{\sum H^S + \sum H^{QV} + \sum H^O}
\]  

(12.17)

where $H^S$, $H^{QV}$, and $H^O$ stand for the proportion of labour sourced from each of the labour pools: search unemployed, quasi-voluntary
unemployed, and those currently employed in the open market sector. If individuals obtain the permanent jobs in a manner unrelated to their supply prices, then:

Comparing this value with the EOCL when there is only quasi-voluntary unemployment, the addition of the economic cost of search unemployment \((W^S)\) will tend to raise the open sector’s wage \((W^O)\) and, hence, raise the EOCL for the project in the protected sector.

12.8.4 No Open Sector and Labour Market Supplied by Migrants

In some circumstances, no open sector has been allowed to develop, because of either the strict enforcement of minimum wage laws or the nature of the development in the area (e.g., there is a one-company town, or the only sources of employment available are protected sector jobs). In this case it is assumed that it is the migration of labour from other regions that is the source of additional workers. Workers will be attracted to the region because the protected sector wage is greater than their supply price of labour for that place. Not all potential workers will find employment; some who come to the area in search of a protected sector job will end up being unemployed.

In this case it is necessary to differentiate between the supply price of an additional potential worker (a migrant) and the EOCL required to fill a job. Potential migrants evaluate their prospects in the region where there are protected sector jobs against the opportunities available around them. If they migrate, there is a probability of finding a protected sector job \((P^P)\) and also a probability of being unemployed \((1 - P^P)\). Hence, from the perspective of a potential migrant, if the protected sector wage
is $W^p$, the expected wage from migrating ($E(W)$) is equal to the product of the protected sector wage ($W^p$) and the probability of being employed in the protected sector ($P^p$), i.e., $E(W) = P^p W^p$.

When there is no open sector, it is the unemployment rate ($1 - P^p$) that brings about the equilibrium between the supply price of a migrant and the protected sector wage. Suppose the supply price for a migrant to move to the region where there are protected sector jobs is $W^m$. As this supply price is less than the protected sector wage of $W^p$, there is incentive for more migrants to move to seek protected sector employment than there are jobs available. This migration process will continue until the probability of finding a protected sector job falls to the point where:

$$P^p = \frac{W^m}{W^p} \text{ and } W = W^p$$

At this point, the potential migrant’s expected wage from moving to the protected sector is just equal to his or her supply price. Furthermore, when more protected sector jobs are created, the number of migrants to the region in pursuit of these jobs will always be greater than the number of jobs. Hence, when the full adjustment has taken place, the equilibrium unemployment rate will be maintained and the number in the pool of unemployed labour will be increased.

To estimate the EOCL for protected sector jobs, we need to account for the opportunity cost of all migrants, both employed and unemployed, who were induced to move in pursuit of these new jobs. If the equilibrium unemployment rate is ($1 - P^p$), for every new protected sector job created there will have to be ($1/P^p$) migrants. The economic opportunity cost of each of these migrants is equal to $W^p P^p$ when the labour market is in equilibrium. Hence, the EOCL to fill a protected sector job is expressed as:

$$ECL = W^p P^p$$

(12.19)
In this case, where it is the unemployment rate that is the equilibrating force between the protected sector and the rest of the economy, the $EOCL$ is equal to the protected sector wage. There is no net economic externality from the creation of protected sector jobs. The additional unemployment created by those searching for a protected sector job inflicts an economic cost on society equal to the difference between the supply price of a migrant and the protected sector wage. As a consequence, when there is no open sector and no other distortions such as taxes, the EOCL for protected sector jobs is the protected sector wage.

When there are taxes levied on the protected sector wage, and taxes are levied on the wages paid in the sending region, the $EOCL$ will need to be adjusted to reflect the net change in tax revenues. The gross-of-tax wage rates in the protected sector and in alternative employment are denoted as $W^p$ and $W^a$, respectively. Further, if the proportion of migrants from the sending region who would have been employed in that region is expressed as $H^a$, and $T$ is the tax rate, the $EOCL$ can be expressed as:

$$EOCL = \frac{P \cdot (a \cdot PW - a \cdot PW)}{1 - (1 - T)}$$

In this situation, the amount of taxes lost from reduced activities in the sending regions must account for the fact that not all the adjustment comes from reduced employment. Further, for every new protected sector job, there will be more than one migrant moving to the labour market where the protected sector jobs are located.

### 12.9 Conclusion

In this chapter, the EOCL has been estimated using the supply price approach under a wide variety of labour market conditions and types of jobs. This approach is shown to be equivalent to the value of the marginal product of labour forgone approach when the latter can be
estimated accurately. The primary reliance of the supply price approach greatly facilitates the estimation of this economic parameter for use in the economic valuation of projects.

A methodology has been outlined in detail to account for several adjustments that may need to be made to this supply price to reflect special labour market characteristics and distortions. Most of these factors, such as income taxes and unemployment insurance compensation, are straightforward and easy to estimate. Others, such as those dealing with interregional and international migration, as well as imperfections in the labour market, including phenomena such as migration-fed, quasi-voluntary unemployment and employment created in protected sector jobs, require a more detailed examination of the labour market. In all these cases, the special features in question give rise to the need for further specific adjustments in the calculation of the EOCL for a specific skill on a particular project.

References


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