AN OPERATIONAL GUIDE TO THE ESTIMATION OF THE ECONOMIC OPPORTUNITY COST OF LABOR IN SOUTH AFRICA

HASAN ALI BIÇAK, GLENN P
 JENKINS, CHUN-YAN KUO and M Benjamin Mphahlele *

ABSTRACT

This paper employs the supply price approach to the estimation of the economic opportunity cost of labor (EOCL) for economic project evaluation in South Africa. As the EOCL will vary by skill, location, and labor market, these factors need to be incorporated in its estimation. South Africa's labor market provides a rich environment to illustrate the importance of estimating this parameter. For the cases examined in this paper the ratio of the EOCL to the project wage ranges from 0.45 to 1.0 for unskilled labor and from 0.98 to 0.73 for skilled labor.

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^{*}Hasan Ali Biçak, is Associate Professor and Dean of the Faculty of Business and Economics, Eastern Mediterranean University, North Cyprus.

Glenn P Jenkins, is Professor of Economics, Queen's University, Canada, Eastern Mediterranean University, North Cyprus, and Institute Fellow Emeritus, Harvard University.

Chun-Yan Kuo, is Senior Fellow, John Deutsch Institute, Queen's University, Canada, and Visiting Professor, Graduate Institute of Finance, National Chiao Tung University, Taiwan.

M. Benjamin Mphahlele, is Head, Department of Finance and Economic Development, Limpopo Province, South Africa.

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1. INTRODUCTION

In most countries the goal of job creation is of paramount political importance. From an economic perspective, however, the benefit of job creation by a project is measured by the amount that the wage bill is in excess of the economic opportunity cost of the labor employed. Unlike the economic opportunity cost of capital and the economic cost of foreign exchange, no single national parameter can be estimated for the economic opportunity cost of labor (EOCL). The EOCL varies by occupation, by skill level, by working environment, by labor market condition, and by region. The objective of this paper is to develop a framework with examples that will serve as a guide for the estimation of the EOCLs across a range of circumstances typical to South Africa.

Section 2 gives a brief overview of the labor market in South Africa, followed by the methods of estimating the EOCL. In section 3 the estimation of the EOCL is illustrated for three cases and then the results are presented of the EOCLs for various types of workers under different employment, taxation and labor market (structures) conditions. Concluding remarks are made in the final section.

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2. AN ANALYTICAL FRAMEWORK

The rate of unemployment in an economy is a key factor determining the EOCL because the economic cost of labor will be affected by the fundamental causes of the unemployment.

Unemployment in South Africa is high and concentrated in the unskilled or semi-skilled occupational categories but is quite low for those in the skilled occupations². Any unemployment in the skilled labor market is mainly structural unemployment. Overall the market for skilled occupations is relatively tight. Industries that employ less educated workers like construction, manufacturing and mining are getting more capital intensive and shedding jobs, while education intensive sectors such as financial services and trade are having slight increases in the capital labor ratio but are still creating additional employment.

After 1994, labor laws were enacted to provide a greater flexibility in wage determination and conditions of employment at the same time providing enhanced protection to the workers.³ Minimum wages are determined by collective bargaining between the government authorities, the employers' representatives and the trade unions for each sector, and for every skill level. For workers, which are not covered in these bargaining agreements, the Employment

³ See Stryker, J.D., Cassim, F., Rajaratnam, B., Bhorat, H., Leibbrandt, M. and Plunkett, D., "Increasing Demand for Labor in South Africa," *Equity and Growth Through Economic Research, Public Strategies for Growth with Equity*, (2001).



 $^{^2}$ In 1999 the official unemployment rate for South Africa was 23.3%, while the extended unemployment rate was as high as 36.2%. This measure includes those members of the labor force that are not actively looking for a job but would accept it when offered. For an official definition of "official unemployment" and "unofficial unemployment," see Statistics South Africa, October Household Survey 1999, (2000).

Conditions Commission is assigned the power to set minimum wages upon request. The effect of these labor laws has been to increase the wage rates of unskilled and semi-skilled labor above their market clearing levels in the formal sector, and to push the excess labor into looking for work in the informal sector.

In estimating the EOCL two alternative starting points for the analysis of this variable may be chosen: the value of marginal product of labor foregone,⁴ or the supply price of labor.⁵ The supply price of labor approach is relatively straightforward and easy to use under a wide variety of conditions in the labor market.⁶ The starting point of this analysis is the gross-of-tax market wage (the supply price) required to attract people of the required skill level to work on the project. The supply price wage will capture the worker's preferences regarding the location, working conditions or any other factors that affect the desirability of working for the project. Unlike the marginal product foregone approach where one must measure both of these components separately, the local supply price directly measures the wage and non-wage costs of employing labor for a particular project as a combined package.

Once the minimum supply price of labor has been determined, the EOCL is calculated by adjusting that value to account for distortions that may affect the market wage rate such as income taxes, social security contributions, unemployment benefits and any other such labor tax or subsidy. Care must be taken to ensure that all of the market distortions which drive a wedge between the supply price and the economic opportunity cost of labor are properly accounted for when estimating the EOCL for the project.

⁶ Edwards, A.C., "Labor Supply Price, Market Wage, and the Social Opportunity Cost of Labor", *Economic Development and Cultural Change*, V.38, No.1, (1989).



⁴ Little, I.M.D. and Mirrlees, J.A., *Project Appraisal and planning for Developing Countries*, (London: Heinemann Educational Books, 1974)

⁵ Harberger, A.C., *Project Evaluation: Collected Papers*, (Chicago: the University of Chicago Press, 1972), Chapter 7.

In certain labor markets, wage rates are determined in relatively competitive markets. The economic cost of labor associated with a project can be measured by the gross of tax supply price, W_g^s , less the income taxes paid if individual is working at this supply price plus the income taxes forgone elsewhere in the economy because a share of this labor, H^d, will have been sourced from alternative jobs where taxes were being paid on wages of W_g^a . The remainder, H^s, would be sourced from either informal labor markets or non market activities where the individuals are not subject to income taxes. The EOCL can be calculated as follows:

$$EOCL = W_g^s (1 - T^s) + H^d W_g^a T^a$$
(1)

where T^s is the average rate of income tax paid on the supply price of labor for the project, T^a is the average income tax rate on the wages paid by alternative jobs.

Some projects need to employ the services of foreign skilled workers. The EOCL in this case will be measured by the net-of-tax wage that the worker receives in South Africa plus an adjustment for the foreign exchange premium that is an additional cost on the share the wages that are remitted by the foreign worker. A second adjustment is related to the goods and services that foreign workers consume in South Africa. If the foreign workers pay any excise or value added taxes on the goods they purchase, these taxes should be deducted from the cost of foreign labor, as they do not represent a cost to the economy of South Africa. In some cases the temporary foreigner workers might receive subsidized housing or benefits such as subsidized health benefits. These should be added to the EOCL.⁷

⁷ A further adjustment may arise if there are various social security taxes or fringe benefit charges that are levied on the foreign labor for which they receive fewer



Combining these factors the economic opportunity cost of foreign worker (EOCL^F) can be estimated as follows:

$$EOCL^{F} = W^{F}(1 - t^{F})) + W^{F}(1 - t^{F})R[(E^{e}/E^{m}) - 1] - W^{F}(1 - t^{F}) (1-R) t^{VAT} + S$$
(2)

where W^F it the gross-of-tax wage of foreign labor, t^F is the rate of personal income tax levied by the host country on foreign labor wages and salaries, t^{VAT} is the average rate of value added tax paid, R is the proportion of the net-of-tax income repatriated by foreign labor, E^e is the economic exchange rate, E^m is the market exchange rate, and S is the value of net benefits gained by foreign workers from subsidized social services.

In South Africa the government regulates the wages in a number of the labor markets or they are determined by collective bargaining agreements. In such markets, the wage rates are above their market clearing rates. Because of the minimum wage rates, there exists a chronic unemployment in this segment of the labour market.⁸ This can be illustrated in Figure 1.

Let W_0S_t be the total supply curve of labor in the market. With the protected wage rate being set at W_p , the total amount of labor supplied in the market at this wage rate would be L_r . There is a limited number of jobs in the economy where the employer is willing to pay the protected page for this type of labour, L_qL_r . This leaves the supply curve of labor in the free market as W_0S_f . To simplify our analysis we will assume that there is a free market wage

⁸ For a detailed discussion see Edwards, A.C., "Labor Supply Price, Market Wage, and the Social Opportunity Cost of Labor", *Economic Development and Cultural Change*, V.38, No.1, (1989).



benefits than they pay taxes. The excess of taxes paid over the value of benefits received should be deducted in the calculation of the EOCL.

of W_f at which everyone could work if they wished. The intersection of this supply curve and the free market wage rate of W_f determines the number of people willing to work at this wage or L_f in Figure 1.



Figure 1: A Protected Labor Market

When a project creates a demand for protected workers, the demand will be met partly by those working in the free market and partly by quasi - voluntarily unemployed workers. If we assume that

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workers are recruited randomly from among all those willing to work for the protected sector wage, the economic cost of these jobs would be measured by the weighted average of the free market wage and the supply price of the quasi-voluntarily unemployed. Hence, the EOCL will fall between the free market wage and the protected wage rate. In the case of linear supply curves the supply price of the quasi-voluntarily unemployed is measured by $(W_f + W_p)/2$, adjusted for tax externalities. Ignoring any tax adjustments for the moment, the EOCL for protected sector jobs can be expressed as follows:

$$EOCL_{p} = f_{1}W_{f} + f_{2}(W_{f} + W_{p})/2$$
(3)

where f_1 and f_2 , respectively, represent the proportions of the project jobs being filled by those now working in the free market and those filled by unemployed individuals who were waiting for new protected project jobs to become available.

3. EMPIRICAL ESTIMATION OF THE ECONOMIC COST OF LABOR

In this section we illustrate the estimation of the EOCL for the three cases outlined above. The results of the estimates of the EOCL using this framework for several types of labour and employment circumstances are summarized in Table 1.

The estimation of the EOCL using the relationship described by equation 1 is illustrated for the case of skilled labor hired by a project located in an urban area. The project will pay the prevailing monthly salary for skilled labor (e.g., senior site engineering technician) R12,830/month⁹ gross of tax and the social security

⁹ Paterson Grading at C_U level, at merit level 0, pays this amount to a senior siteengineering technician. Levels, A_1 - A_3 is for unskilled labor, B_1 - B_5 is for semi skilled, CL - CU for skilled, DL - DU for first level management, EL - EU for senior management and F for director. For every level there is a merit sub-levels from 0 to 10.



payments. These social security payments include the social insurance premium (12.52% of gross of tax salary), workers' compensation fund for injury (2.55%) and unemployment benefit fund (2%). The total of these payments is 17.07%. The skilled workers are assumed to place a value on the fringe benefits they receive equal to what they cost and to include them in their supply prices. Hence, the supply price of labour in this case will be equal to the total financial cost of labour or R180,240/yr.

The annual before tax salary of R153,960 in 2001 is subjected to R8,720 of site taxes and R35,409 PAYE tax, making the total R44,129/annum. Given the relative tightness of the labor market for the senior engineering technicians, the proportion of the project's workers that are hired away from other jobs, H^d, is assumed to be in the order of 90%. Hence, the proportion of the project's workers met from the increased labor force participation or non-market activities or unemployment is thus 10%.¹⁰

The supply price approach for estimating the EOCL for skilled labor starts with the private supply price and then makes adjustments to it for taxes paid and lost. Gains in the tax revenues from the new employment (R44,129) are deducted from the EOCL, as they are not an economic cost to the economy and are considered a benefit to the government. On the other hand, taxes forgone (R39,716) from the previous employment of the workers are added to the EOCL because the value of the marginal product of labor in the alternative employment must have been large enough for the workers to pay these taxes. By substituting into equation 1 we have,

EOCL = W^p+Fringe benefits-taxes on supply price+taxes forgone

¹⁰ It assumes that there is no change in the unemployment rate and a quantity equal to 10% of the new workers hired are entering the labor force or from other informal sector employment.

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= 153,960 (1 + 0.1707) - 44,129 + 39,716= 175,828 R/annum.

By dividing its EOCL by its corresponding financial cost, the economic conversion factor for this type of labour is estimated to be 0.98.

The EOCL of non-South Africans employed in South African can be estimated by applying equation (2). Suppose an engineer employed abroad prior to his assignment in South Africa accepts a salary of R440,000 per annum to work in South Africa. For the purpose of this example it is assumed that he will be subject to an average income tax rate of 25%, the average value added tax rate for South Africa is 9.5 percent. The foreign labors are expected to repatriate 40% of his net-of-tax income. The foreign exchange premium is estimated to be equal to 6.0%.¹¹ The worker receives no subsidy from the government, i.e., S = 0. Substituting the above figures in equation (2) yields:

 $EOCL^{F} = R440,000 (1 - 0.25) + [R440,000 (1 - 0.25)] * 0.40 * 0.06$ - [R440,000 (1 - 0.25)] * (1 - 0.4) * 0.095= 319,110 R/annum

The economic conversion factor in this case for skilled non-South African labor in South Africa is therefore equal to 0.73.

The application of equation (3) can be illustrated for the situation where an urban project hires unskilled labor and pay wages higher than the market wage rate. In terms of the civil engineering sector, the minimum wage rate in September 2001 was R5.22/hr. or R1,266/month for a general worker at its first merit level (lowest) in

Economic Cost of Foreign Exchange for South Africa", South African Journal of *Economics*, Vol. 71:2, (June 2003).



¹¹ Harberger, A.C., Jenkins, G.P., Kuo, C.Y., and Mphahlele, M.B., "The

Polokwane.¹² The minimum wage rate varies from region to region. Considering the wage rate differential between the informal (R651/month) and formal (R1,266/month) sectors in Polokwane, there will be some unskilled workers who would not like to work in the informal sector but would like to work in the formal sector but are unable to find any work. These workers will have a supply price that is above the informal market wage, but below the institutionally set wage.

Based on equation (3), the EOCL will be estimated by a weighted average of the informal sector wage rate (W^{f}) and the average supply price of the quasi-voluntary unemployment [($W^{f} + W^{p}$)/2]. The relevant weights are the proportions that each of these categories is chosen to work in the formal sector project. Under a random selection method, the weights are the fraction that the total informal sector employment is of the total supply of unskilled labor, f_{1} , (assumed to be 20%) and the fraction of the total labor force that is not working in either the informal or the formal sector wages is f_{2} , (i.e., 80%). Thus, the EOCL of unskilled labor in the formal sector can be estimated at R897/month.

As the project is in the formal sector and unions are involved, the firm will pay the social insurance premiums for the labor. The contribution of the employer is 7.52% and the employee is 5%, of the amount of the wages paid. The employer is also compelled by law to pay 2.55% of the wages paid to the Workmen's Compensation Fund for injury on duty and 1.5% to the Skills Development Fund. Both employer and the employee have to pay 1% of wages each to the Unemployment Benefit Fund. Furthermore, the employer is compelled to pay 150 hrs of

¹² Unskilled labor works 47.5 hours per week and an additional of 36 hours payment is made as attendance payment. Monthly total working hour is 242.4 hrs (47.5 * 4.337 + 36).

¹¹

productivity bonus (R783) a year. This is equivalent to R65/month. In total, the financial cost of labor to the employer is R1,490/month. As the wage rate in the formal sector, R15,192/annum, is below the tax exempt threshold, the worker is not liable to pay any personal income tax on his wages. Hence, the EOCL for unskilled labor employed in the formal sector is equal to 60% of its financial cost to the employer.

These same concepts can be applied to various types of labor employed in different locations and different labor market conditions. The results of a selected number of such labour market situations in Limpopo Province, including those outlined above, are summarized in Table 1.

Project	Level of	Sources	Project	Prevailing	EOCL	Ratio of
Location	Skill	of	Wage ^a	Market		EOCL to
	Acquired	Workers	_	Wage ^a		Project
	-			_		Wage
Urban	Unskilled ^b	Local	651	651	651	1.00
Urban	Unskilled ^c	Local	1,490	651	897	0.60
Rural	Unskilled ^d	Local	468	468	468	1.00
Rural	Unskilled ^e	Local	1,490	468	668	0.45
Urban	Skilledf	Elsewhere	15,020	15,020	14,652	0.98
Urban	Skilledg	Elsewhere	16,729	15,020	14,652	0.88
Outside of	Skilled ^h	Urban	18,438	18,438	16,860	0.91
Polokwane						
	Skilled ⁱ	Foreign	36,667	36,667	26,592	0.73
Urban		0				

Table 1 Estimates of the EOCL in Limpopo Province (rands per month)

Note:

^{a.} Project wage or prevailing market wage refers to the gross wage including tax, social security payments, and fringe benefits.

^{b.} Unskilled worker employed in informal urban labour market.

^{c.} Unskilled worker employed in unionized urban labour market.

^{d.} Unskilled worker employed in informal rural labour market.

e. Unskilled worker employed in unionized rural labour market.

f. Senior Site Engineer technician employed in urban area.

g- Senior Site Engineer technician employed in urban area, earning higher than market wage.

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4. Concluding Remarks

Labor markets in South Africa are characterized by high rates of unemployment of unskilled labor, close to full employment of skilled labor and are generally highly regulated. In such a situation the wage rate paid by a project for a particular skill or occupation can be significantly different from its economic opportunity cost. As the project wage is increased the ratio of the economic cost to the financial cost of labor will usually fall, even though the absolute value of the EOCL will tend to rise.

We find that the estimates of EOCL range all the way from being equal to the wage rate paid to being only 45 percent of the wage rate for unskilled labor and from 0.98 to 0.73 for skilled labor. These rates are highly sensitive to the location, skill level, and whether or not the project will be creating protected or unprotected sector employment. The supply price approach to the estimation of the economic cost of labor allows one to estimate this parameter over a wide range of different labor market settings. The purpose of this analysis is to provide an operational guide for such estimations in South Africa.



 ^{h.} Senior Site Engineer technician employed in rural area, earning market wage for region.
 ^{i.} Engineer with skills that had to be sourced from abroad.

Sources: Cambridge Resources International, Inc., Integrated Investment Appraisal: Concepts and Practice, prepared for the Department of Financial and Economic Development, Lompopo Provincial Government Republic of South Africa, (March 2004), Appendix D.

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