MODELLING THE LABOUR MARKET IN FIJI

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Abstract

This paper develops a simple model for Fiji's labour demand and supply. The model is estimated over the period 1970 to 2000 as an unrestricted error correction model (ECM), allowing for lagged terms so as to capture dynamic adjustment effects. The results suggest that Fiji's labour market adjusts very slowly to equilibrium levels in period (t) from a disequilibrium experienced in period (t-1). In the short run, labour force participation is significantly affected by changes in real wages and unemployment. However, in the long run, unemployment appears to be insignificant in determining labour force participation, while real wages and working population growth have a significant positive impact on labour force growth. On the labour demand side, changes in real GDP appear to be positively correlated to employment levels. Wages on the other hand, accounts for very little adjustment.

1.0   Introduction

Many studies with much empirical effort have been devoted to explaining the causes of unemployment and its variability across countries and regions. Early literature focused on using cross-sectional or pooled cross-sectional data on indic ators of labour market performance and labour market institutions to account for unemployment differentials across countries (see Blanchard and Katz, 1992, Agnor, 1995, Scarpetta, 1996, Nickell, 1997). Recently, the literature has evolved to explaining unemployment differentials across countries by interactions of macroeconomic shocks and labour market institutions (see Blanchard and Wolfers, 2000, Morgan and Mourougane, 2001).

In this paper we use time series data to provide an overview of labour market developments in Fiji over the last three decades. We also develop a two-equation model for Fiji's labour demand and supply using the error correction technique. The Error Correction Model (ECM) specifications used, allows for lagged terms to capture dynamic adjustment effects.

Most studies find that labour market institutions and regulations (such as trade unions, social security benefits, employment security, minimum wage, mismatch and tax wedge) via their impact on wage formation, significantly impact employment decisions of firms and thus affect unemployment. Although, we have covered the effects of these institutional factors to some length in our literature review, we do not investigate the impact of these factors on Fiji's labour market in this paper. Our objective here is to develop a simple two-equation model that captures economic variables that determine the demand and supply for labour in Fiji

and that identify the relevant characteristics of Fiji's labour market and its response to exogenous innovations.

The rest of the paper is structured as follows: Section 2 briefly reviews literature on the labour market. Section 3 provides an overview of Fiji's labour market. Section 4 sets out the modelling strategy. Section 5 presents the empirical results and Section 6 concludes the paper.

2.0   Literature Review

Most studies find that in developing countries, the labour market is divided into three different categories: the rural sector, informal urban sector and formal urban sector. The rural sector usually has a large share of self-employed and unpaid family workers. An informal urban sector is characterised by small privately owned enterprises producing mainly services and other non-tradable goods and relying (in addition to their own input) on paid labour without any formal wage and employment contract. The formal urban sector consists of large enterprises that hire employees both skilled and unskilled according to formal contracts and are subject to various labour regulations.

The existence of these sectors is often associated with labour market segmentation; workers with similar productive skills receive different wage depending on their sector of employment. The best-known model of labour market segmentation in developing countries is the migration model of Harris and Tadaro[1] (1970). This model explains the persistence of rural to urban migration, despite the existence of widespread urban unemployment

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[1] Cited in Todaro (1982), Economics for a Developing World.

in developing countries. The explanation proposed by Harris and Todaro is that migrants from the rural areas are attracted to the urban formal sector by expectations of higher wages, even if they are unlikely to find jobs in the formal sector immediately.

A feature of the Harris-Todaro model is that to restore equilibrium an increase in the urban wage would lead to an increase in urban unemployment. It follows that an increase in labour demand raises urban wage and is likely to induce more migration, and hence worsen urban unemployment. However, critics of the Harris-Todaro model argue that the equilibrium conditions specified by the model is seldom attained as in reality migration does not close the gap between the urban wage and the rural wage, (Gills et al., 1996).

In many developing countries, public sector employment accounts for a large share of wage employment and formal sector workforce. According to Demekas and Kontolemis (1999) the public sector has a significant role in the labour market. Evidence shows that reductions in public sector employment in the formal sector (or reduction in recruiting rates) have led in some countries to higher employment in the informal sector.[2]

In most countries public sector employees are treated very differently from their counterparts in the private sector. Employment and wage decisions are made differently in each sector. Kraay and Rijcheghem (1995) provided strong evidence that government wages are positively correlated with the level of government resources, and negatively correlated with the level of private sector employment. Moreover, in many countries

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[2] See Hollister and Goldstein (1994) studies on Morocco.

there appears to be some evidence of persistent public/private wage differentials (Agenor, 1995). Heller and Trait (1983) find a positive wage differential between public and private sector in developing countries in their cross-country study, although the evidence for OECD countries[3] is weaker.

Public sector wages and salaries are low in comparison with private sector salaries, which make it difficult to attract and retain qualified workers in the civil service. Low public sector wages and salaries are often budgetary consequences of 'over-employment' in the public service. According to Agenor (1995), government pay and employment policies affect private labour contracts through a variety of channels. Rational optimising workers and private sector employers are bound to take public sector decisions into account when making job search, wages and employment decisions.[4] Evidence has shown that most industries set wages according to the system of salary scales adopted by the public sector. One common feature includes the incorporation of a one-time salary adjustment into agreements as a cost of living escalator. Each time a collective agreement is reviewed, an increment between 2 to 3 percent will be given to allow for the increase in prices. Similarly most companies also give automatic annual increments while some companies incorporate a provision in the workers contract whereby the increment is paid when the worker has performed to a desired standard.

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[3] Organization for Economic Cooperation and Development Countries (UK, USA, Australia, Canada, Austria, France, Germany, Italy, Norway, Spain and Japan).
[4] See Demekas and Kontolemis (1999) for empirical evidence on Greece.

The existence of labour market institutions and regulations (such as trade unions, social security benefits, employment security, minimum wage and tax wedge) as well as mismatch between job seekers and vacancies may represent important sources of labour market segmentation as they have a profound impact on wages and employment. A number of studies have been conducted to evaluate the impact of labour market institutions on employment across countries. According to Agenor (1995), trade union activism and the rise of the various types of employee protections have reformed the legal framework of the labour market. While rigid wage differentials and union activities are known to have slowed down resource shifts between formal and informal sectors (despite a generally high geographical mobility of the labour market), in several countries employment-protecting measures have made firms reluctant to expand their labour force.

Morgan and Mourougane (2001) express similar arguments. In their study of the impact of labour market institutions and other structural factors on unemployment in Europe, they find that labour market institutions significantly have an influence on employment decisions of the firms and thus affect unemployment.

One of the factors that appear to have a significant impact on wages and employment growth is minimum wage. There is clearly a potential role for minimum wages to force up overall wages. The imposition of a minimum wage will raise the incomes of those who would otherwise be earning below the minimum threshold but it is also likely to have some impact on higher levels of income as attempts to, at least partially, restore

pay differentials.[5] The primary objective for minimum wage is to prevent vulnerable workers from being exploited. On the contrary, minimum wage could lead to increased unemployment. Firms unable to afford minimum wage would either go out of business or do with fewer workers. Employers would be encouraged to use more capital-intensive techniques. Moreover, firms usually price their products by adding a margin to the cost of their inputs (wages). Therefore, businesses that are unwilling or unable to absorb such costs would pass them on to consumers in the form of higher prices. Thus, minimum wage appears as a form of labour market inefficiency if wages are not determined by demand and supply.

Another factor that influences employment decisions are trade unions via their influence on wages. According to Morgan and Mourougane (2001), powerful trade unions are more likely to secure high wages for their members. Thus the extent of the influence on wages depends on the bargaining power of unions. Empirical evidence on the impact of union on real wages in developing countries is somewhat limited and mixed. Jones[6] (1994) suggests that in Latin America, unions have caused wages to rise above the opportunity cost of labour through a combination of union pressures, minimum wage legislation, and wage policies in the public sector. According to Farber (1986) trade union strength leads to higher wages and higher unemployment. Empirically, union strength is often proxied by measures of union density or by the proportion of workers covered by union contracts. In existing empirical studies,[7] these proxies

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[5] See Morgan and Mourougane (2001).
[6] Cited in Agenor (1995).
[7] See Garibaldi and Mauro (1999), Morgan and Mourougane (2001).

appear to increase unemployment, although this effect seems to be mitigated when unions and firms coordinate their bargaining activity (Nickell, 1997).

The generosity of unemployment benefits is another important factor that may be considered in wage bargaining. According to Morgan and Mourougane (2001), high unemployment benefits when available for a long duration improve the fall back position of workers in the event that they lose their jobs and will encourage them to push for higher wages than they will be able to without the benefit. Also it is highly possible that such a safety net will reduce the job search effectiveness of those already unemployed. This is called unemployment hysteresis. Thus generally, unemployment benefit may be expected to put an upward pressure on wages and thereby give rise to unemployment. Similarly, Nickell (1997) and Sheldon[8](1993) argue that higher unemployment benefits (in terms of both replacement rates and duration) result in higher unemployment and lower job creation in most theoretical models of the labour market, and have been found to be empirically associated with higher unemployment.

Employment security has also been found to play a role in wage bargaining although the nature of this role may be uncertain. Employment security can be referred to as an individual's ability to maintain employment within a particular firm or organization. Morgan and Mourougane (2001) argue that the so-called 'insider-outsider' problem is made worse by employment security particularly if imposed through legislation. The incumbent workers (insiders) with their strong positions

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[8] Cited in De Masi and Henry (1996).

are able to bid up wages despite the existence of a large number of potential new employees. Thus employment security makes it easier for insiders to secure higher wages and associated with this effect is unemployment.

Another important factor to consider in the employment decision is the wedge between wages paid by employers and that received by employees. According to Morgan and Mourougane (2001), this factor has an impact on unemployment. The wedge comprises of the purchasing power effect, and the direct tax effect. The first takes into account real wages in terms of consumer prices while, the second explains the gap between labour costs paid by the firms and workers' compensation (wages) by way of measuring all direct tax such as income tax and social security compensations. The effect of these factors on unemployment depends on who bears the burden of these charges in the long run. If the burden falls on employees than this will not have any significant effect on the labour compensation (wages). However, if the burden falls on the employers than it will lead to higher compensation paid by employers and hence lowers the likelihood of additional employment.

According to Morghadam (1993), workers tax wedge (combination of social security contributions and income tax) is among the highest in OECD countries. The employers' tax wedge; the share of social security in the wage bill, is also very high. The same can be said for developing countries particularly those that have large income tax structures and social security compensation schemes. The existence of high tax wedge both for workers and employers appears as a disincentive on the part of both the employee to seek jobs and employer to seek additional labour. This is an

obstacle to employment and stimulates an expanding black market for labour.[9] Black market for labour implies employment without compliance to labour laws or policies laid down by employment agencies or tax authorities. Daveri and Tabellini (2000) argue that on both theoretical and empirical grounds higher taxes lead to higher unemployment and lower output growth.

Mismatch[10] between job seekers and vacant positions can also influence unemployment. Moghadam (1993) suggests that evidence on the mismatch between skills held by workers and those demanded by employers are rather difficult to reconcile. For example, indicators based on unemployment by occupation largely consider the supply side of the market, and since skills are defined on the basis of the last job held, they exclude all the unemployed without previous experience.

According to De Masi and Henry (1996) a factor that is often thought to account for increases in unemployment is the mismatch between unemployed workers and jobs; and the skills and location of these workers. It should be added, however, that earlier studies on various European countries reveal that mismatch probably contribute little to the rise in unemployment. Recent studies by Morgan and Mourougane (2001) show that measures of mismatch have a clear positive association with structural unemployment.

Apart from labour market institutions a large number of studies have focused on analysing economic variables such as real wages, output and

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[9] Moghadam (1993) explains the high tax wedge in Belgium as compared to industrialized countries has potentially strong disincentives to both employees and employers.
[10] Mismatch is a broad term encompassing many aspects of differences between the demand and available supply of labour (Morgan and Mourougane, 2001).

economic growth and their impact on the labour market. Agenor (1995) suggests that movements in the real wage have an ambiguous effect on labour mobility. A fall in the wage will encourage out-migration because working in the region is relatively lower. On the other hand, the lower wage will increase labour demand and encourage in-migration.

In a wider literature survey Sheehan, et al., (1979) find little evidence of a significant relationship between employment and real wages. They cite evidence from a number of early labour market studies, including Higgins and Fitzgerald (1973), Valentine (1975), Gregory and Sheehan (1973) and Clark (1976).[11] None of these studies find a significant role for real wages in the employment decision. Gruen (1979) and Holmes (1979) argue that Sheehan, Derody and Rosendale (1979) were highly selective and that a more extensive survey will be required to complement their conclusion.[12]

Output is another economic variable that is known to have a strong correlation with employment. Gregory and Duncan (1979) examine the post-1974 relationship between output and employment. They find that productivity growth actually slowed following the rise in real wages in the early 1970s. This led them to conclude that the key to growth in employment at that time was stronger growth in output.

More recently, Revenga and Bentolia (1995) note a clear positive relationship between changes in output and changes in the employment rate. They examine a sample of 11 OECD countries and find the link between employment and output to differ significantly across countries.

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[11] Cited in Russell and Tease (1988).
[12] Cited in Russell and Tease (1988).

Output-employment elasticity varied across OECD countries, as high as 0.574 for United Kingdom to as low as 0.098 for Japan. Further, their result suggest that some structural and institutional factors such as wage bargaining by trade unions, unemployment benefit, the degree of competition in the product market did affect this relationship.

Freebairn[13] (1977), in a survey of the Australian literature, finds significant role for both output and real wages in employment equations. Studies conducted in the 1980s add support to this conclusion. Schelde-Andersen (1980), using cross-section evidence for a range of industries, finds that both output and real wages play an important role in determining the level of employment. He concludes that output and real wage elasticities are of the same order of magnitude but of opposite sign. The long-run elasticity of employment with respect to output in a number of the studies surveyed ranges between 0.65 and 0.70, while the long run wage elasticity is around -0.5; implying that a 1 percent increase in the wage bill will decrease labour demand by 0.5 percent.

In general, studies on labour market in developing countries are often constrained by limited data availability. Thus the effects of labour market institutions and regulations may appear to have an ambiguous effect on the demand and supply for labour. Agenor (1995) states that published data on unemployment in developing countries are often incomplete. They usually include unemployed workers looking for jobs in the formal sector, but failed to capture underemployed workers in the informal and rural sectors, thus understating the effective excess supply of labour. He also states that

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[13] Cited in Russell and Tease (1988).

standard labour market concepts used in the individual countries (such as
employment and unemployment) do not necessarily have the same meaning
and must be interpreted with care.

3.0   An Overview of Fiji's Labour Market

3.1   Labour Force

Over the past 3 decades, the growth in Fiji's labour force[14] has been
mixed (see FIGURE 1). During 1970s, the labour force grew on average
by around 3.3 percent but it slowed down to around 2.5 percent in the early
1980s.

FIGURE 1
Labour Force Growth
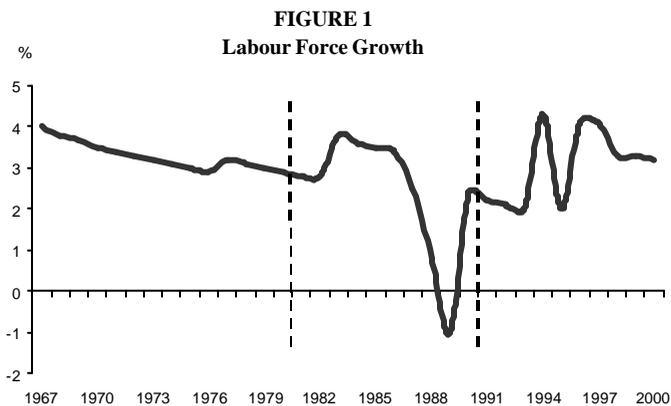
Sources: Fiji Islands Bureau of Statistics & Reserve Bank of Fiji

In the mid 1980s the labour force growth picked up. However, due to
the 1987 political crisis, which triggered a large emigration of both skilled

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[14] Labour force in cludes employed individuals and those searching for jobs.

and unskilled labour, the growth in labour force contracted to around 0.8 percent in 1988.

During, the early 1990s growth in the labour force recovered to average of around 3.0 percent per annum as emigration numbers dropped. However, much of the late 1990s and 2000 experienced slower growth in labour force participation.

3.2 Unemployment

The unemployment rate averaged around 5-6 percent during the period under review (see FIGURE 2). The most significant increase in the unemployment rate was observed in 1987 and 2000 when the rate reached over 9 percent.

FIGURE 2
Unemployment Rate

Sources: Fiji Islands Bureau of Statistics & Reserve Bank of Fiji
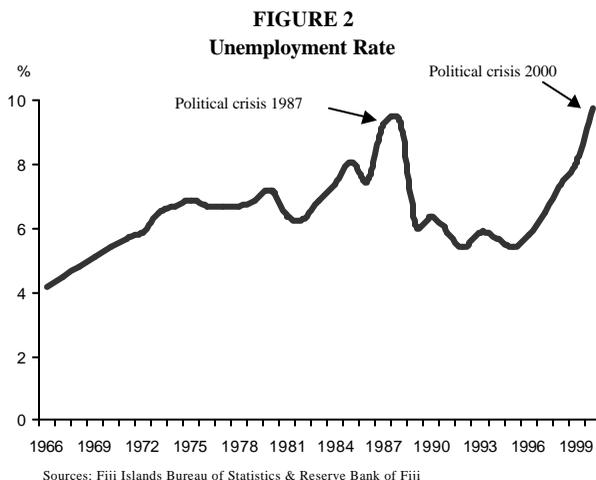
The immediate aftermath of the two coups resulted in large labour redundancies and fewer new jobs, as firms were operating below capacity and as a result resorted to shutting down or downsizing their operations.

In the late 1980s to mid 1990s, unemployment fell to moderate levels as the economy recovered, through a series of measures implemented by authorities to promote economic growth. Among such measures was the devaluation of the Fiji dollar,[15] and export promotion policies (such as the tax free factory/tax free zone).

However, subdued public and private investments in employment creation relative to the growth in the number of job seekers (school leavers and new graduates) contributed to high unemployment in the late 1990s.
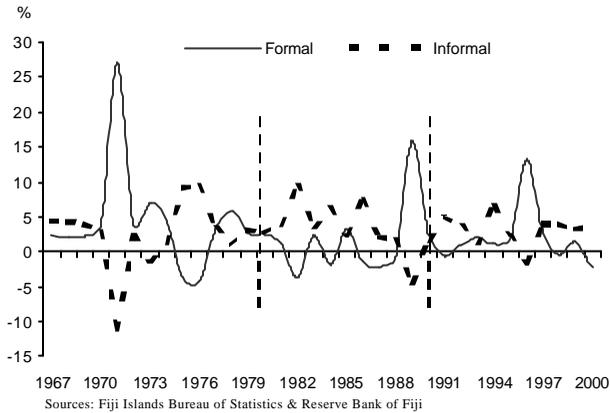
3.3   Employment

During the review period, employment (both in the formal and informal sectors) grew on an average by around 2.8 percent per annum (see FIGURE 3). Employment in the two sectors is negatively correlated and it is evident from FIGURE 3. This suggests that there exist a high mobility of labour between the two sectors. Since Fiji has a high literacy rate, around 93 percent,[16] this enables informal sector workers to reach efficiency levels (through education and training) and to some extent develop skills equivalent to formal sector workers over a short period of time.

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[15] The Fiji Dollar was devaluated twice in 1987; 17.75 percent in June and 15.25 percent in October.
[16] Fiji Islands Bureau of Statistics (1999 est.)

FIGURE 3
Employment Growth

Sources: Fiji Islands Bureau of Statistics & Reserve Bank of Fiji

In the early 1970s, formal employment growth was at its peak of around 27.1 percent resulting from the establishment of number of new ventures. The manufacturing sector in particular, was largely driven by Fiji's import substitution policies (high tariff protection, import licensing and quotas). Formal employment growth was also supported by high public sector investments in infrastructure developments. On the other hand, the informal sector experienced a negative employment growth of 11.1 percent. This indicates that majority of informal sector workers who quit informal employment entered the formal sector.

However, from the mid 1970s to the mid 1980s formal sector employment growth slowed as the economy contracted gradually, resulting from a slow down in the sugar industry following series of natural disasters, together with the weak performance of inefficient import substitution

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industries and reduced public and private investments.[17]   In addition, the political crisis of 1987 stimulated a further decline in production and labour redundancies in many industries in the formal sector of the economy. These drove huge number of workers back to the informal sector resulting in growth of informal employment.

From the late 1980s to mid 1990s, formal sector employment levels recovered as the government reoriented its trade policy from import substitution to export promotion. Government in its effort to encourage export industries set up tax-free factory/zone schemes, particularly aimed at the production and export of garments, textiles and footwear. The success of this schemes resulted from a notable increase in private investments. This resulted in workers moving back to the formal sector to fill in the newly created positions.

The late 1990s experienced a slowdown in formal employment as the economy contracted once again due to subdued private and public investments coupled with a prolonged drought experienced in 1997 and 1998. This slowdown enhanced further following the political upheaval of 2000, which triggered higher levels of emigration of professional/technical workers and capital outflows suppressing local investments (dampening prospects for job creation).   However, there was a slight increase in informal sector employment indicating that some redundant workers from the formal sector joined the informal sector to stay in employment.

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[17] See Seruvatu and Jayaraman (2001)

3.5   Economic Growth and Employment

Labour market developments in Fiji suggest a clear positive co-relation between economic growth and employment (see FIGURE 4).

FIGURE 4
Economic Growth and Employment Rate

Source: Reserve Bank of Fiji
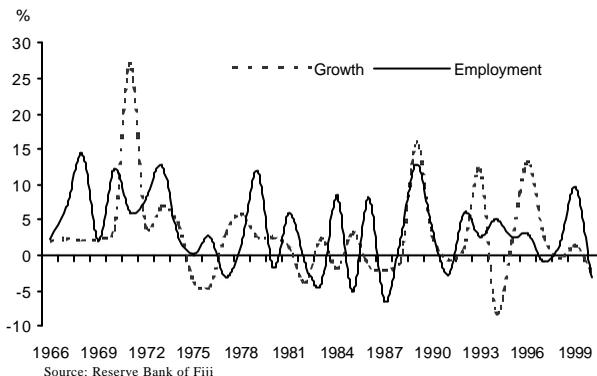
This relationship between these two variables is derived from the economic theory, which states that the primary sources of economic growth are land, labour and capital.   Generally, we find that during times of economic growth, employment increases, while in periods of an economic contraction, employment falls.

Looking at the past trend in economic growth and employment it is clearly evident that on an average the relationship between the two variables is also contemporaneous. This means that if GDP increases in a particular year, then employment also increases in that year.[18]

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[18] This is true for most years in the sample period. However, in some years there is a one year lag.

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3.6 Wages

Fiji's wage growth has been very uneven over the past three decades (see FIGURE 5). Wage growth picked up sharply in the mid 1970s reaching a peak of nearly 30 percent in 1973. However, wage growth declined through much of the late 1970s and by mid 1980s wages were growing very slowly. In the late 1980s wages fell, while growth was moderate in the 1990s, averaging a little over 4 percent per year until 2000, when wages fell to a three decade low of around negative 4 percent.

FIGURE 5
Wages Growth : (Annual Percentage Change)

Sources: Fiji Islands Bureau of Statistics & Reserve Bank of Fiji
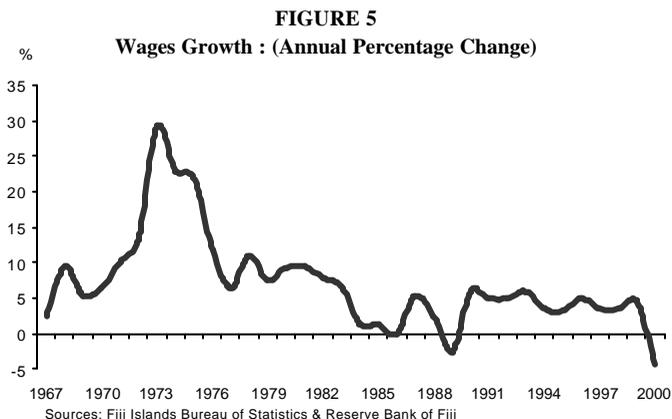
A variety of wage regulations have underpinned the evolution of wages since the 1970s. Regulated wage policies were introduced in Fiji after an agreement was signed in 1977 between the Government, Fiji Trades Union Congress (FTUC), and the Fiji Employers Federation (FEF)

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to establish the Tripartite Forum.[19]   Under this centralised wage setting system, wages were originally indexed to the Consumer Price Index (CPI), and later on, were set according to reference to a variety of other economic variables. Prior to the tripartite forum, wage agreements used to be worked out on an ad hoc basis, which was under constant threat of strikes and lockouts.

During the 1980s and early 1990s, wages outcomes have been heavily impacted by centralised policy decisions. Following the lifting of wage freeze imposed in the 1980s, new wage setting guidelines were introduced in 1986 based on a formula provided by the Fiji Employment and Development Mission (FEDM), Central Planning Office and the Reserve Bank of Fiji. Wages were adjusted according to a weighted average of movements in the terms of trade, productivity, and the CPI. The political events of 1987 forced the government to impose a 15 percent cut in civil service wages and salaries. With the dissolution of the Tripartite Forum in 1987, wages were frozen for the first six months of 1988. Successive wage awards followed between 1989 and 1991, partly aimed at restoring earlier wage cuts.

Since the late 1990s the focus has been on allowing wage rates to be determined by market forces on the basis of productivity and efficiency, although elements of cost of living adjustments still remain. The Tripartite Forum was revived during this period but it mainly engaged in discussions of major wages and salaries related issues and did not engage in setting wage guidelines.

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[19] Cula (1996).

In 2000, wage growth slowed down due to the political upheaval, which suppressed many sectors of the economy as businesses cut back on production, due to weakened domestic demand and reduced export orders. However, wages were restored to pre-coup levels following a number of wage awards in 2001. In the private sector (in non-garment industries) wage awards ranged from 2 to 8 percent, while in the public sector these ranged from 3 to 12 percent.

4.0 Modelling Strategy

In this paper, a simple 2-equation model of the labour market is developed and estimated for the period 1970 to 1999. This model uses current and lagged variables, such as employment, labour force and wages.

The model contains variables designed to measure both the supply and the demand for labour. Equations for each are presented below.

4.1 Labour Supply Equation

The labour supply equation describes the size of the labour force and is determined by exogenous variables such as population growth, and endogenous variables such as unemployment rate and real wages. In general, the labour force function can be expressed as:

$$lf = f(X, Z) \tag{1}$$

where *lf* is the labour force, *X* is other endogenous variables, and Z is a vector of exogenous variables.

The endogenous variables in particular, the real wage rate is used by potential workers to decide unilaterally whether or not to enter the labour market based on the current wage that they can get if employed. Specifically, an increase in the real wage rate motivates households to increase labour supply. Conversely, a fall in the real wage rate would reduce the supply of labour.

The other important endogenous variable, the unemployment rate, has 2-sided effect on labour supply. At higher levels of unemployment, the *discouragement effect* tends to discourage workers to participate in the workforce because the probability of getting a job is low. However, a lower level of unemployment rate encourages workers to participate in the workforce. Under the *additional worker effect*, higher levels of unemployment for primary workers result in secondary workers entering the workforce to maintain the family income.

Turning to exogenous variable, the working age population growth is also an important determinant of the labour supply. Working age population growth rate has an expected positive relationship with labour supply. However, it takes a long time to manifest its effect on labour supply.

Lagged labour force is also added to the equation as an adjustment factor since cost of entry to and exit from the labour force often make the current labour force depend on its magnitude.

Thus, equation 1 can be rewritten as an Autoregressive Distributed Lag (ADL) model of the form:

$$lf_t = a_o + \sum_{i=0}^{d} a_i rwi_{t-i} + a_{2i} ur_{t-1} + \sum_{i=0}^{e} a_{3i} wpg_{t-i} + g_j lf_{t-1} + e_t \qquad (2)$$

where *lf* is the labour force, *rwi* is the real wage, *ur* is the unemployment rate, *wpg* is the working age population and e_t is an error term.

Equation 2 can now be transformed and specified as an Error Correction Model (ECM) in the form:

$$\Delta lf_t = a_o + \sum_{i=0}^{d} a_i \Delta rwi_{t-i} + a_{2i} ur_{t-1} + \sum_{i=0}^{e} a_{3i} \Delta wpg_{t-i} + a_{4i} rwi_{t-1} + g_j lf_{t-1} + e_t \qquad (3)$$

Let $b_1 \equiv \sum_{i=0}^{d} a_i$, $b_2 \equiv a_{2i}$, $b_3 \equiv \sum_{i=0}^{e} a_{3i}$, $b_4 \equiv a_{4i}$, $b_5 \equiv g_j$.

The full-reduced form of this system is:

$$\Delta lf = a_0 + b_1 \Delta rwi_{t-i} + b_2 ur_{t-i} + b_3 \Delta wpg_{t-i} + b_4 rwi_{t-i} + b_5 lf_{t-j} + e_t \qquad (4)$$

where Δ is the first difference operator, *lf* is the labour force, $\boldsymbol{a}_0$ is a constant, *rwi* is the real wage, *ur* is the unemployment rate, *wpg* is the working age population and $\boldsymbol{e}_t$ is an error term.

Equation (4) is used as a basis for our empirical tests in section 5.

4.2   Labour Demand Equations

The labour demand is derived from the firm's desire to maximise profits.   The simple rule of the thumb suggests that firms would hire additional workers and expand production as long as profits increase; bring more revenue than the additional cost in wages.

The employment function can be expressed as:

$$N = f(X, Z) \tag{5}$$

where *N* represents employment, *X* is other endogenous variables and *Z* is a vector of exogenous variables.

Our labour demand equation is taken from a simple Cobb-Douglas production function with the assumption of constant returns to scale. The equation describes real output *y* as a function of labour input *N*, with the level of capital stock and other inputs *K* held constant or varying in direct proportion to labour in the *short run*. The shape of the production function $y(N; \overline{K})$ shows that as labour input increases, output also increases. This continues up to a point where an added labour has no effect on output

[where $y(N; \overline{K})$ flattens out] or it could even result in a fall in output [where $y(N; \overline{K})$ turns downwards].

This relationship is reflected by the slope of a line from the origin to any point on the production function and is commonly known as the average product of labour *(APL)*, or average labour productivity y/N. It shows that as employment increases, the *APL* first increases and then decreases.

The slope of the production function, $\partial y / \partial N$, gives the marginal product of labour *(MPL)*. With the production function first convex, showing increasing returns, and then concave, showing diminishing returns, the *MPL* will reach a maximum point at a certain labour input where the production function changes from convex to concave. As a firm increases employment, the resulting increase in output is given by *MPL.*

For a firm in perfect competition, facing a given price level, the revenue increase from an increase in employment is given as:

$$\Delta R = P \cdot \frac{\partial y}{\partial N} \cdot \Delta N \tag{6}$$

where $P \cdot (\partial y / \partial N)$ is the marginal value product of labour, R is revenue.

The increase in cost, ΔC, to the firm hiring an additional labour is simply the money wage rate times change in labour ($W \cdot \Delta N$). The money wage rate can be written as:

$$W = P \cdot \frac{\partial y}{\partial N} \quad \text{or} \quad w \equiv \frac{W}{P} = \frac{\partial y}{\partial N} \qquad (7)$$

where P is prices and w is real wage rate.

This gives us the firm's equilibrium employment condition and the demand-for-labour function. If an addition to the labour force is such that $\Delta R > \Delta C$, a profit-maximising firm will hire additional labour until $\Delta R = \Delta C$.

The demand-for-labour function can also be interpreted as follow: if $W_o/P < (\partial y / \partial N)$ or $W_o < P \cdot (\partial y / \partial N)$, the firm will hire additional labour. If the direction of the inequality is reversed, firms will reduce the amount of labour hired. We are assuming that the monopolistic firm's demand for labour will be qualitatively similar to that of the competitive firm.

Real GDP forms a proxy for economic activity variable for demand, and has an expected positive effect on employment. The assumption here is that firms choose prices, output and employment on the basis of their expectation of economic activity.

Real wages on the other hand, has an expected negative effect on employment due to profit maximisation objectives of firms i.e. increases in the real wage would result in firms cutting cost by reducing employment.

In addition, employment adjustment effect is a familiar lagged response in employment, often caused by the presence of adjustment costs on labour inputs. The underlying idea is that when firms face cost of adjusting their employment such as hiring, training, and firing costs; their current employment decisions will depend on their past employment.

Thus, a generalised Autoregressive Distributed Lag model of employment takes the form:

$$N_t = \boldsymbol{a}_o + \sum_{i=o}^{d} \boldsymbol{a}_i \, rgdp_{t-i} + \sum_{i=o}^{e} \boldsymbol{a}_{2i} w_{t-i} + \boldsymbol{g}_j N_{t-1} + \boldsymbol{e}_t \qquad (8)$$

where N represents employment, $\boldsymbol{a}_0$ is a constant, $rgdp$ is real gross domestic product, w represents real wages and $\boldsymbol{e}_t$ is an error term.

Equation (8) can be re-parameterised as an Error Correction Model by adding and subtracting lags of variables:

$$\Delta N_t = \boldsymbol{a}_o + \sum_{i=o}^{d} \boldsymbol{a}_i \Delta rgdp_{t-i} + \sum_{i=o}^{e} \boldsymbol{a}_{2i} \Delta w_{t-i} + \boldsymbol{a}_{3i} rgdp_{t-1} + \boldsymbol{a}_{4i} w_{t-1} + \boldsymbol{g}_j N_{t-1} + \boldsymbol{e}_t \qquad (9)$$

Let $\boldsymbol{b}_1 \equiv \sum_{i=0}^{d} \boldsymbol{a}_i$, $\boldsymbol{b}_2 \equiv \sum_{i=0}^{d} \boldsymbol{a}_{2i}$, $\boldsymbol{b}_3 \equiv \boldsymbol{a}_{3i}, \boldsymbol{b}_4 \equiv \boldsymbol{a}_{4i}, \boldsymbol{b}_5 \equiv \boldsymbol{g}_j$.

The full-reduced form of this system is:

$$\Delta N = \boldsymbol{a}_0 + \boldsymbol{b}_1 \Delta rgdp_{t-i} + \boldsymbol{b}_2 \Delta w_{t-i} + \boldsymbol{b}_3 rgdp_{t-1} + \boldsymbol{b}_4 w_{t-1} + \boldsymbol{b}_5 N_{t-1} + \boldsymbol{e}_t \qquad (10)$$

where Δ is the first difference operator, N represents employment, $\boldsymbol{a}_0$ is a constant, $rgdp$ is real gross domestic product, w represents real wages and $\boldsymbol{e}_t$ is an error term.

Equation (10) is used as a basis for our empirical tests in section 5.

5.0   Empirical Results

5.1   Characteristic of the data

The empirical analysis was conducted using annual data from 1970 through 2000. The data were obtained from the Reserve Bank of Fiji, the IMF International Financial Statistics, and the Fiji Bureau of Statistics although in some cases data were constructed *(see Appendix A).*   All variables, except for the unemployment rate, are in logs.

The most important feature of the variables under consideration is their stationarity (or lack thereof). All variables are tested for stationarity using the standard Augmented Dickey-Fuller (ADF) (Said and Dickey 1984) and the Phillips and Perron (1988) procedure.

The results are presented in Table 1 and Table 2. All variables are order one or I(1) except for working age population growth under the Phillips–Perron test. This suggests that working age population growth variable could be stationary or I(0).

Table 1: Unit Root Tests for Labour Supply Variables

Variable	Dickey – Fuller Test		Phillips – Perron Test	
	Level	**1st difference**	**Level**	**1st difference**
Real wage	-2.237	-6.161**	-2.619	-7.169**
Working age population growth	-2.328	-5.075**	-3.844**	-9.830**
Unemployment rate	-1.770	-3.836**	-1.900	-5.154**
Labour force	-1.694	-4.962**	-2.655	-8.312**

Notes: **(*) denotes significance at the one (five) per cent levels. The critical values for the Augmented Dickey – Fuller tests are –3.685 and –2.624 at the one and five percent levels respectively. The critical values for the Phillips – Perron tests are –3.675 and –2.622 at the one and five percent levels respectively.

Table 2: Unit Root Tests for Labour Demand Variables

Variable	Dickey – Fuller Test		Phillips – Perron Test	
	Level	**1st difference**	**Level**	**1st difference**
Employment	-2.521	-5.942**	-2.249	-4.454**
Real GDP	-0.097	-5.095**	-0.387	-7.896**
Real Wage	-2.237	-6.161**	-2.619	-7.169*

Notes: **(*) denotes significance at the one(five) per cent levels. The critical values for the Augmented Dickey – Fuller tests are –3.685 and –2.970at the one and five percent levels respectively. The critical values for the Phillips – Perron tests are –3.666 and –2.962 at the one and five percent levels respectively.

5.2 Estimation

The model is estimated using ordinary least squares (OLS), under the specifications of an unrestricted error correction model (ECM). This approach enables the long-run equilibrium relationship and the short-run

dynamics to be estimated simultaneously. This approach is recommended over the two-step Engle -Granger procedure, particularly for finite samples, where ignoring dynamics when estimating the long-run parameters can lead to substantial bias.[20]

One of the advantages of this specification is that it isolates the speed of adjustment parameter, b, which indicates how quickly the system returns to equilibrium after a random shock. The significance of the error correction coefficient is also a test for cointegration. Kremers, Ericsson and Dolado (1992) have shown this test to be more powerful than the Dickey-Fuller test applied to the residuals of a static long-run relationship. Another re-parameterisation, the Bewley (1979) transformation, isolates the long run or equilibrium parameters and provides t-statistics on those parameters.

5.3   Diagnostic tests

It is important to investigate the statistical properties of the model in order for our results to be accurate and creditable. We have performed a number of diagnostic tests on the two specified equations to do this.[21]

5.3.1 Autocorrelation

We performed the Breusch–Godfrey test for first-order autocorrelation in our residuals. There was no significant evidence of the

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[20] Banerjee et al. (1993) show that substantial biases in static OLS estimates of the cointegration parameters can exist, particularly in finite samples, and that unrestricted error correction models can produce superior estimates of the cointegrating vector.
[21] See Appendix B, Tables B1 and B2 for detailed results on diagnostic tests.

first – order autocorrelation and this suggests that lag structure used in this model is appropriate.

5.3.2 Heteroskedasticity

Using White-Heteroskedasticity test, we find that statistically there is no significant evidence that suggests the existence of heteroskedasticity, or unequal variances in this model. This is consistent with theory which states that heteroskedasticity does not usually occur in time series studies, because changes in dependent variable and changes in one or more of the dependent variable are likely to be of the same order of magnitude.[22]

5.3.3 Other Tests

Other diagnostic tests indicate that residuals are white noise, and the parameters appear to be stable (*refer to Appendix B, Tables B1 and B2*).

5.4   Economic Interpretation of Results

The results for each equation will be discussed in somewhat greater detail in the following subsections.

5.4.1 Labour Supply

Although this is clearly a simplified equation, it has certain interesting features. Table 3 shows the preferred specifications for the labour force equation in error correction form.

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[22] Pindyck and Rubinfeld (1981).

Table 3: Determinants of Labour Supply (Unrestricted ECM)
Dependent variable:Δ Labour force; estimation period 1970 – 2000

	(1)	(2)
Explanatory variables: short run		
Constant	-0.788	
	(-3.681)**	
Δ Real Wages	0.118	
	(3.209)**	
Unemployment Rate$_{t-1}$	-0.006	
	(-5.071)**	
Dummy	-0.114	
	(-2.957)**	
Explanatory variables: long run		
Labour Force $_{t-1}$	0.045	
	(4.018)**	
Real Wages $_{t-1}$	0.060	1.333
	(3.540)**	(-2.849)**
ΔWorking Age Population $_{t-6}$	0.258	5.708
	(3.551)**	(18.974)**
Summary statistics		
Adjusted R^2	0.84	
SE	0.0045	

Notes: t-values are in parentheses. **(*) denotes significance at the one(five) per cent levels. For the long-run explanatory variables, the implied long-run coefficients (column 2) were calculated as the ratio of the relevant long-run ECM coefficients to the long-run coefficient on the lagged dependent variable; the Bewley transformation was applied to obtain interpretable t-statistics. The cointegration test proposed by Kremers, Ericsson and Dolado (1992) is employed. SE is the standard error of regression.

Explanatory variables in the short run, real wages and the unemployment rate, appeared to be significant and showed the right signs. Real wages has an expected positive effect on the labour force participation while unemployment appears to be negatively correlated with changes in the labour force. The dummy variable is used as a proxy for exogenous

shocks such as the political crisis (1987). Coefficient on the dummy variable shows a significant negative effect on labour force participation.

The long run relationship shows a positive coefficient on the working population and real wage variables, which is consistent with the rational decision to participate in the labour force. Estimation results suggests that on average, it takes 6 years for a change in working population to significantly cause changes in labour force participation. Thus, suggesting that majority of workers in Fiji enter the labour force approximately at the age of 21. The unemployment rate does not feature in the long run relationship, because its coefficient was not robustly significant and the equation failed to cointegrate when it was included.

Turning to error correction specifications, several features of the regression results stand out. First, it is interesting to note that the coefficient on the error correction term, while significant and carrying the correct sign, is quite small, implying a slow adjustment to the long run relationship. Results suggest that on average, there is only a 4.5 percent adjustment in period (t) to the disequilibrium in period (t-1). Second, the unemployment rate, which did not participate in the long run relationship, plays a dynamic role. Lagged changes in unemployment on balance have a slightly negative effect on the labour force participation, perhaps owing to the discouragement-worker effect. A rise in measured unemployment tends to be mitigated by declines in the labour force. Thus, the detrimental effects of unemployment may be underestimated if one looks only at the unemployment rate without considering the loss of the productive potential of the discouraged workers. Measures to keep the long-term

unemployment in touch with the labour market may be especially important in this respect.

Combined, short run and long run explanatory variables explain 84 percent of the variation in the labour force. The other 16 percent is unexplained by the model. The deviations in the labour force that the model is unable to capture could be explained by the exclusion of non-economic factors or qualitative factors that affect the labour force participation such as tradition and cultural values, early retirement, and life expectancy of workers.

5.4.2 Labour Demand

The preferred error correction specifications of the employment equation are presented in Table 4.

Table 4: Determinants of Paid Employment (Unrestricted ECM)
Dependent variable: Δ Employment; estimation period 1970 – 2000

	(1)	(2)
Explanatory variables: short run		
Constant	0.465	
	(3.553)**	
ΔReal GDP	0.098	
	(3.898)**	
ΔReal Wages $_{t-1}$	-0.072	
	(-2.629)*	
Dummy	-0.014	
	(-5.018)**	
Explanatory variables: long run		
Employment $_{t-1}$	-0.105	
	(-3.903)**	
Real GDP$_{t-1}$	0.118	1.123
	(4.033)**	(25.492)**
Summary statistics		
Adjusted R^2	0.56	
SE	0.0057	

Notes: t-values are in parentheses. **(*) denotes significance at the one(five) per cent levels. For the long-run explanatory variables, the implied long-run coefficients (column 2) were calculated as the ratio of the relevant long-run ECM coefficients to the long-run coefficient on the lagged dependent variable; the Bewley transformation was applied to obtain interpretable t-statistics. The cointegration test proposed by Kremers, Ericsson and Dolado (1992) is employed. SE is the standard error of regression.

As expected, the results show a significant positive relationship between Real GDP and employment. In the short run, a one percent increase in real GDP, on average, leads to about 0.098 percent increase in employment. While in the long run a one percent increase in real GDP on average, would result in a 1.12 percent increase in employment.

On the other hand, real wages as expected showed a negative effect on employment, with a coefficient of 0.07 in the short run. A one percent

increase in real wages, on average, would reduce employment by 0.07 percent in the short run. However, in the long run real wages appeared to be insignificant.

On balance, lagged values of the dependent variable have a slightly negative impact with a small coefficient (only 0.10) implying a slow adjustment process. The dummy variable, which is used as a proxy for negative shocks such as political crisis and natural disasters appears to be significant but to a smaller magnitude.

Finally, the values obtained for R^2 (0.64) and the adjusted R^2 (0.56) imply that the model is able to explain 56 percent of the variations in employment, while the other 44 percent deviation is caused by the impact of institutional factors such as trade unions activism, skills mismatch and employment security which are not modelled in this paper.

6.0   Conclusions

Looking at a number of labour market variables over the study period with significant lags for both employment and the labour force, some valid conclusions can be made.

On the supply side, the results reveal that the labour force responds negatively to unemployment, suggesting that discouraged workers leave the labour force. The results also suggest a strong positive correlation between working population growth and labour force participation. Real wages also appears to be significant and positively related to labour force participation as expected.

On the labour demand side, we find a clear positive correlation between employment levels and economic growth. During times of economic growth, employment increases, while in periods of an economic contraction, employment falls. Wages on the other hand, tends to significantly affect employment in the short run but accounts for very little adjustment in the long run.

Furthermore, the study also finds that the Fiji's labour market exhibits considerable sluggishness in adjustment. The results suggest that Fiji's labour market adjustments are slow to adjust to equilibrium levels after exogenous shocks such as political crisis or natural disasters.

Appendix A Data Sources and Construction

Series	Sources and Construction
Labour Force	Labour force comprises people who meet the ILO definition of the economically active population.
	IFS International Financial Statistics Yearbook (2000); IFS *International Financial Statistics,* various issues; WDI *World Development Indicators*; various issues; ILO, Publications, various issues. Bureau of Statistics, *Current Economic Statistics*, various issues; Reserve Bank of Fiji, *database* (2002).
Unemployment rate	Calculated as Annual percentage change of people who meet the ICLS (1982) definition of those without jobs in the reference period.
	Bureau of Statistics, *Current Economic Statistics*, various issues; Reserve Bank of Fiji, *data base* (2002); IFS *International Financial Statistics*, various issues.
Working age population	Calculated by adding number of persons between the age15 and 55 form population figures.
	Bureau of Statistics, *Current Economic Statistics*, various issues; *1996 Fiji Census of population and housing, general tables*, various issues; IFS *International Financial Statistics* Yearbook (2000); Reserve Bank of Fiji, *Annual report*, (1978 – 2000).
Real wages	Data on Wages Index after adjusting for Inflation.
	IFS *International Financial Statistics* Yearbook (2000); IFS *International Financial Statistics*, various issues; Bureau of Statistics, *Current Economic Statistics,* various issues.
Real GDP	Gross Domestic Product at constant factor cost.
	IFS *International Financial Statistics Yearbook* (2000); IFS *International Financial Statistics,* various issues*;* Bureau of Statistics, *Current Economic Statistics,* various issues.
Employment (N)	Data on employment is the total formal and informal sector employment calculated by subtracting unemployment figures from the total labour force.
	Bureau of Statistics, *Current Economic Statistics*, various issues; *1996 Fiji Census of population and housing, general tables*, various issues; IFS *International Financial Statistics* Yearbook (2000); Reserve Bank of Fiji, *Annual report*, (1978 – 2000).

Appendix B Diagnostic tests

Table B1: Diagnostics for Labour Supply Equation

			Probability
Normality:			
Jarque-Bera statistic	χ^2-statistic	3.827	0.147
Serial Correlation:			
Breusch-Godfrey Serial	F-statistic	0.217	0.806
Correlation LM Test	χ^2-statistic	0.650	0.722
AR Cond. Heteroskedasticity:			
ARCH LM Test	F-statistic	0.009	0.921
	χ^2-statistic	0.010	0.917
Heteroskedasticity:			
White Heteroskedasticity	F-statistic	0.408	0.929
Test	χ^2-statistic	6.318	0.851
Stability:			
Chow Breakpoint Test	F-statistic	0.261	0.958
(mid sample)	LR-statistic	3.690	0.815
Chow Forecast Test	F-statistic	0.773	0.657
(1990-1998)	LR-statistic	25.580	0.019*
Specification Error:			
Ramsey RESET Test	F-statistic	0.954	0.491
	LR-statistic	9.487	0.148

Notes: **(*) denotes significance at the one(five) per cent levels. LR is a likelihood ratio statistic.

Table B2: Diagnostics for Labour Demand Equation

			Probability
Normality:			
Jarque-Bera statistic	χ^2-statistic	0.249	0.883
Serial Correlation:			
Breusch-Godfrey Serial	F-statistic	0.132	0.877
Correlation LM Test	χ^2-statistic	0.360	0.835
AR Cond. Heteroskedasticity:			
ARCH LM Test	F-statistic	0.619	0.614
	χ^2-statistic	2.002	0.572
Heteroskedasticity:			
White Heteroskedasticity	F-statistic	1.099	0.408
Test	χ^2-statistic	9.929	0.356
Stability:			
Chow Breakpoint Test	F-statistic	1.120	0.392
(mid sample)	LR-statistic	9.662	0.139
Chow Forecast Test	F-statistic	0.608	0.790
(1990-1999)	LR-statistic	12.858	0.303
Specification Error:			
Ramsey RESET Test	F-statistic	0.118	0.734
	LR-statistic	0.155	0.693

Notes: **(*) denotes significance at the one(five) per cent levels. LR is a likelihood ratio statistic.

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