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## Labor Mobility in Bolivia: On-the-job Search Behavior of Private and Public Sector Employees

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# **Institute for Advanced Development Studies**



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### **Labor Mobility in Bolivia: On-the-Job Search Behavior of Public and Private Sector Employees**

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# **Worker mobility in Bolivia: On-the-job search behavior of private and public sector employees<sup>#</sup>**

by

Lykke E. Andersen\*  
&  
Bent Jesper Christensen\*

January 2006

## **Abstract:**

Labor market frictions are even more pervasive in developing countries than in Western industrialized economies. In spite of this, stochastic models of frictional markets have rarely been applied to developing countries. In this paper, we estimate structural parameters of both a simple and an extended job separation model with the purpose of understanding constraints in the labor market in Bolivia. The results confirm the hypothesis that skilled labor is scarce in Bolivia, while unskilled labor is abundantly available. This implies that skilled employees shop around for alternative employment opportunities and quit their jobs when a better opportunity arises. The quit rate among skilled employees in the private sector is much higher than the quit rate among skilled employees in the public sector. The reverse is true for the lay-off rate, and together this suggests that the private sector has difficulties maintaining its skilled labor. The private sector might try to improve its capacity to retain skilled employees by increasing wages, but the wage sensitivity parameters estimated in this paper suggest that this is not going to work – skilled employees in the private sector do not seem to reduce their on-the-job search in response to higher wages.

**Keywords:** Mobility, on-the-job search, labor markets, Bolivia.

**JEL classification:** J62, J63, J64, J31.

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## 1. Introduction

Frictions characterize labor markets in developing countries even more than in Western industrialized economies. In spite of this, the frictional approach to labor market analysis has almost exclusively been applied to developed countries. One reason that fewer studies have been conducted in developing countries, in spite of the obvious relevance of the frictional approach here, may be that contractual features typically differ from those in developed countries. Thus, the typical employer-employee relationship with open ended contracts as found in developed countries is relatively rare in developing countries. In Bolivia, for example, less than 7% of the economically active population (EAP) are formally employed with an open ended contract<sup>1</sup>. The rest of EAP are either employed without any contracts, employed with time-limited contracts, self-employed, or looking for work. The informal sector consisting of self-employed people with subsistence farms in rural areas or micro-enterprises in urban areas account for more than 60% of EAP in Bolivia.

In this paper we apply the frictional approach to data from Bolivia, by estimating a model of on-the-job search. We concentrate on employees, i.e. people working for an employer and receiving a regular salary, whether they have signed a contract or not. This segment accounts for almost 1/3 of EAP and is very important for the effective functioning of the economy. The public sector needs these employees in order to provide public services (teachers, health personnel, bureaucrats, policemen, etc.), and the private sector needs them to produce goods and services.

It is often believed that the existence of the large informal sector implies that there is an almost unlimited supply of workers available for the formal sector to choose from (e.g. Harris & Todaro, 1970; Sabot, 1977; and Mazumdar, 1983), but in reality the public sector and the formal private sector may be competing for a very limited number of people with the necessary skills. In this paper, we investigate the degree of worker mobility in different segments of the labor market, and estimate the extent to which workers engage in on-the-job search for better opportunities. We decompose rates of job separation into a part determined by employers and a part determined by employees.

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<sup>1</sup> The figure is based on the 2001 Living Standard Measurement Survey conducted by the National Statistical Institute of Bolivia.

The main hypothesis to be tested is that skilled workers are in short supply, so for them the main component of job separations is employee determined (quits), whereas unskilled workers are abundant, so for them most job separations are employer determined (lay-offs). Differences between public sector and private sector employees are explored, and, in particular, the sectors are compared in terms of their success at keeping their employees.

The remainder of the paper is organized as follows. Section 2 presents the simple and extended structural job separation models to be estimated. Section 3 discusses the data used and presents some summary statistics. Section 4 presents the estimation results and the interpretation of these. Section 5 concludes.

## 2. Methodology

The empirical model builds on Burdett's (1978) theory of employee job search and quit rates. Consider an employed worker who is currently earning a wage  $w$ . The worker may from time to time receive offers to move to other jobs in other firms. We assume that the worker moves to any higher-paying job offered, but stays if the new offer is for a wage lower than  $w$ .

Job offers are drawn from an offer distribution  $F$ . Thus, the probability that an offer received exceeds the current wage  $w$  is  $1-F(w)$ . To calculate the probability that the worker leaves the firm within a given time interval, we must include the probability of receiving such an offer within the interval. We denote this offer arrival probability by  $\lambda$ . Thus, the probability of both receiving and accepting an offer during the given time interval is  $\lambda (1 - F(w))$ . Finally, we also allow the possibility of exogenous job dissolution, e.g. layoffs. Therefore, we write the hazard rate for leaving the firm within the given time interval (namely, the job separation rate) as  $d = \delta + \lambda (1 - F(w))$ , on interpreting  $\lambda$  as the rate of offer arrival, and defining  $\delta$  as the exogenous separation rate.

It is clear that the separation rate  $d$  is lower for a worker earning a higher wage  $w$ , everything else equal. Therefore, we often write the separation rate as  $d(w)$ . The

mechanism is simply that a higher wage ensures that a smaller fraction (specifically,  $(1 - F(w))$ ) of the offers received exceed the current wage. Hence, more of the offers are turned down, and the worker stays longer in the job. High wages work to keep on employees.

After estimating this basic model, we will also estimate an extended version, allowing  $\lambda$  to depend on  $w$ . The idea is that the worker may decide to engage actively in on-the-job search, expending effort to generate more offers. Such activity could involve contacting potential employers, looking at job ads, asking around, etc.. Since these efforts are costly, especially in terms of time spent, it is expected that a high current wage would generate less intense search effort, and hence fewer offer arrivals, i.e., a lower  $\lambda$ . Hence, in this case we write  $\lambda = \lambda(w)$ , and we interpret  $\delta$  as the employer determined component and  $\lambda(w)(1 - F(w))$  as the employee determined component of the separation process.

We parameterize the wage sensitive offer arrival rate as  $\lambda(w) = a + bw$ , a linear offer arrival rate. The hypothesis is that  $b < 0$ , i.e., a higher wage implies that it is less important for the worker to seek a better job. Note that the job separation hazard  $d(w) = \delta + \lambda(w)(1 - F(w))$  is downward sloping even if  $\lambda$  is constant, as in the basic model, i.e., when  $b = 0$ . Thus, a finding of  $b < 0$  indicates very strong dependence of the separation rate on the wage, stronger than what can be explained solely by the position of the wage in the offer distribution. It is such strong wage sensitivity of the separation hazard that would indicate active and costly on-the-job search. This has been found in developed countries (e.g. Christensen *et al* 2005). The hypothesis we investigate is that costly on-the-job search also takes place in developing countries, specifically in Bolivia.

The estimation of the above model involves calculating the empirical c.d.f.  $F$  of wage offers for the subsample of interest, then estimating the parameters  $\delta$  and  $\lambda$  (or  $\delta$ ,  $a$  and  $b$  in the extended model) from data on whether workers are movers or stayers over a given interval, say, one year, conditioning on the position of their current wage  $w$  in the distribution  $F$ .

Since the model implies a job separation hazard  $d(w)$  which does not exhibit any duration dependence, job durations are exponentially distributed, with p.d.f.  $h(T) = d \exp(-dT)$  and hence c.d.f.  $H(T) = 1 - \exp(-dT)$ , where  $T$  denotes the job duration. We may thus calculate the probability that a given worker employed by the firm at the beginning of the year is a stayer, i.e., stays with the firm for the whole year, as:

$$P_{stayer} = P(T > 1) = 1 - P(T < 1) = 1 - (1 - \exp(-d \cdot 1)) = \exp(-d).$$

Similarly, we have that the probability of a mover is  $P_{mover} = 1 - P_{stayer} = 1 - \exp(-d)$ .

Consider a sample of size  $N$  of workers with wages  $w_i$ ,  $i = 1, \dots, N$ , at the beginning of a given year. The parameter vector to be estimated is  $\theta = (\delta, a, b)$  in the extended model. In the simple model, we simply impose  $b=0$  and identify  $a$  with  $\lambda$ . For each worker  $i$ , we define  $d(i; \theta) = \delta + \lambda(w_i)(1 - F(w_i))$ . We also define  $I_{stayer}(i)$  as the indicator variable taking the value 1 if worker  $i$  is a stayer, and 0 otherwise. Here, a stayer is simply defined as a worker who is still with the same firm at the end of the year. Similarly,  $I_{mover}(i)$  is the indicator for a mover, i.e., a worker who is at the end of the year no longer with the same firm. Thus,  $I_{stayer}(i) + I_{mover}(i) = 1$ .

The offer distribution  $F$  is calculated from observed wages of new hires (workers who have been employed in the firm less than 1 year) within the subsample of interest. If there are  $M$  workers who have been employed less than 1 year in their present firm, the corresponding  $M$  wages are simply ordered from lowest to highest to form an empirical c.d.f. for the offer wage distribution.

With these definitions, the log likelihood function is:

$$\begin{aligned} \log L(\theta) &= \sum_{i=1}^N (\log(P_{stayer}(i))I_{stayer}(i) + \log(P_{mover}(i))I_{mover}(i)) \\ &= \sum_{i=1}^N (-d(i; \theta)I_{stayer}(i) + \log(1 - \exp(-d(i; \theta)))I_{mover}(i)). \end{aligned}$$

This function is maximized numerically using Stata 8.0. Asymptotic standard errors are calculated as the square roots of the diagonal elements of minus the inverse Hessian at the optimum.

### 3. Data

The data used in this paper are extracted from the two Living Standard Measurement Surveys (MECOVI) conducted in Bolivia in 2001 and 2002. There are 2.870 employees of working age (15-64 years) in the 2001 survey and 2.998 in the 2002 survey. These employees are pooled together to form the sample of 5.868 employees used in this project. The salaries observed in 2001 are multiplied by a factor of 1.052 to make them comparable to the salaries in 2002<sup>2</sup>.

The data set contains information on current salary and time in current job, but not on past salaries. From time in current enterprise we calculate the indicator  $I_{mover}$ , assigning it the value 1 if time in current enterprise is less than 52 weeks and 0 if it is 52 weeks or more. We do not know the salary by the beginning of the period (52 weeks before survey date), but use as a proxy the salary at the time of the survey. This estimate is quite precise for stayers, but potentially less so for movers who may have moved exactly in order to increase their salary, as the model would posit. However, the estimation exploits cross-section variation in salaries, and this variation is considerably larger than any salary increase an individual mover might expect over the year. Thus, we expect a good fit as long as movers tend to have lower wages than stayers, and take more than a year after the move to make up this difference. In fact, in our data, the average wages of movers and stayers are Bs. 5.24 and 8.32 per hour, respectively, hence supporting the validity of our wage proxy.

Employees are working under three different types of contractual arrangements which are expected to affect their job search behavior: 1) Open-ended contracts (“item” in Spanish), 2) Time-limited contracts, and 3) No contract. About 60% of employer-employee relationships are characterized by the absence of formal contracts, and

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<sup>2</sup> The average employee salary measured in Bolivianos increased by 5.2% between 2001 and 2002. This is less than the rate of devaluation (9.1%), but higher than the inflation rate (2.3%), as measured between November 1<sup>st</sup> 2001 and November 1<sup>st</sup> 2002 by the Central Bank of Bolivia. We use the 1.052 factor to make salaries from the two years comparable.



although Bolivian labor legislation stipulates that anybody employed for more than 6 months in the same enterprise enjoys protection as if being on contract, this is difficult to enforce, and workers are essentially unprotected. As for the two contract types, the main difference between 1) and 2) is in fact not one of duration, but rather that open-ended “item” contracts entail benefits such as health insurance, maternity leave, severance pay, etc., whereas time-limited contracts do not. Furthermore, the latter may be terminated at any point at very low cost to the employer, and are on the other hand also frequently rolled over into a new time-limited, so duration is far from fixed. It thus makes sense to apply models of stochastic separation rates to workers under all three arrangements and interpret results with these differences in mind.

The distribution of employees across the different combinations of sector and contract arrangement is given in Table 1 below. It is seen that the majority of public sector employees (60%) are privileged with open-ended contracts, which are in high demand due to the high degree of job security entailed. We would expect that people in such secure jobs would be less likely to engage in on-the-job search than people on time-limited contracts or no contract at all. In contrast, the vast majority (76%) of private sector employees do not have any kind of contract at all.

*Table 1: Number of employees in data set, by sector and contract type*

# of employees	Open-ended contract	Time-limited contract	No contract	<b>Total</b>
Public sector	1037	356	349	<b>1742</b>
Private sector	317	677	3132	<b>4126</b>
<b>Total</b>	<b>1354</b>	<b>1033</b>	<b>3481</b>	<b>5868</b>

Table 2 shows the average hourly wage for each of these 12 sub-groups. On average, public sector employees earn wages that are about 82% higher than those of private sector employees, creating an additional incentive for people to search for public sector jobs.

People with no contract on average earn less than half as much as people on time-limited or open-ended contracts.

*Table 2: Average wage rates (2002-Bs./hour) of employees in data set, by sector and contract type*

Average wage (2002-Bs./hour)	Open-ended contract	Time-limited contract	No contract	<b>Total</b>
Public sector	12.46	10.11	6.53	<b>10.79</b>
Private sector	13.09	8.94	4.56	<b>5.93</b>
<b>Total</b>	<b>12.61</b>	<b>9.35</b>	<b>4.76</b>	<b>7.38</b>

We would expect that the higher the job security and the higher the salary, the more people would cling to their jobs. Table 3 shows that the negative relation between job security and job change is indeed strong. Combining with the information from Table 2, it would seem that the relation between wage and job change is less pronounced. The latter effect runs counter to the predictions of the model if applied to the full sample, and suggests that fitting the model to subsamples is appropriate and leaves a chance of picking up the potential negative relation between wage and search effort.

The probability of having changed job within the last 12 months is about 9% for people on open-ended contracts, 33% for people on time-limited contracts, and 39% for people with no contract. Due to the predominance of open-ended contracts in the public sector, job turn-over is considerably lower in the public sector than in the private sector.

*Table 3: Average probability of employee having changed job within the last 12 months, by sector and contract type*

P <sub>mover</sub>	Open-ended contract	Time-limited contract	No contract	<b>Total</b>
Public sector	0.088	0.393	0.375	<b>0.208</b>
Private sector	0.079	0.292	0.389	<b>0.349</b>
<b>Total</b>	<b>0.086</b>	<b>0.327</b>	<b>0.388</b>	<b>0.307</b>

The average probability of leaving a job during a year is calculated from the observed fraction of movers. Table 4 shows average number of weeks in present job, which, due to the right censoring, does not correspond to expected job durations. It is nevertheless clear that average job durations for public sector employees are substantially higher than average job durations for private sector employees. The time in present job is almost 50%, or 21 months, longer for public sector employees than for private sector employees. This is a consequence of the predominance of employees with open-ended contracts in the public sector.



*Table 4: Average number of weeks in job until survey date, by sector and contract type*

Average number of weeks in job	Open-ended contract	Time-limited contract	No contract	<b>Total</b>
Public sector	348	173	195	<b>282</b>
Private sector	381	182	174	<b>191</b>
<b>Total</b>	<b>356</b>	<b>180</b>	<b>176</b>	<b>218</b>

It is worth noting that the distribution of job durations is extremely skewed. Short durations of less than one year are by far the most common, but the averages are pulled up by some workers, especially in the military and in the teaching profession, having worked 30-40 years in the same company/institution.

Table 5 shows that the average level of education among employees in the data set is 10.0 years. On average, employees in the public sector have about 4.2 more years of education than employees in the private sector, which helps explain why public sector employees earn higher wages. Indeed, a simple earnings regression, including education, experience, experience squared, a public sector dummy, and a gender dummy, suggests that public sector employees do not earn significantly more than private sector employees with the same basic characteristics.

*Table 5: Average years of education of employees, by sector and contract type*

Average years of education	Open-ended contract	Time-limited contract	No contract	<b>Total</b>
Public sector	14.5	11.8	9.9	<b>13.0</b>
Private sector	12.5	11.2	7.9	<b>8.8</b>
<b>Total</b>	<b>14.0</b>	<b>11.4</b>	<b>8.1</b>	<b>10.0</b>

The theory assumes that job change decisions are made based on salaries offered, rather than on more complicated and uncertain calculations of expected returns to changing jobs. The latter would require knowledge about expected job duration and expected salary increases during the future period of employment, as well as the same information for all future jobs. Such information is extremely uncertain in Bolivia, and it is quite reasonable to assume that people make their job change decisions based almost exclusively on the salary offered.

Table 6 shows summary statistics for the offer distributions for all employees and various sub-samples. These are calculated from the salaries of employees who have recently changed job (movers).

The average offer salary is Bs. 5.24/hour, corresponding to about US\$0.70/hour. It is much higher for the skilled (Bs. 7.74/hour) than for the unskilled (Bs. 3.88/hour), whereas there is practically no difference between the wages offered to men and to women. It is higher in urban areas (Bs. 5.53/hour) than in rural areas (Bs. 4.45/hour), although the difference is surprisingly small. Indigenous employees on average earn about 16% less than non-indigenous employees, although the difference in education levels is minor (9.7 years for indigenous employees versus 10.3 years for non-indigenous). Public sector employees earn on average 72% more than private sector employees. This difference is partly explained by differences in education levels and experience, but even when controlling for these factors, the difference between wages offered in the public and in the private sector remains large.

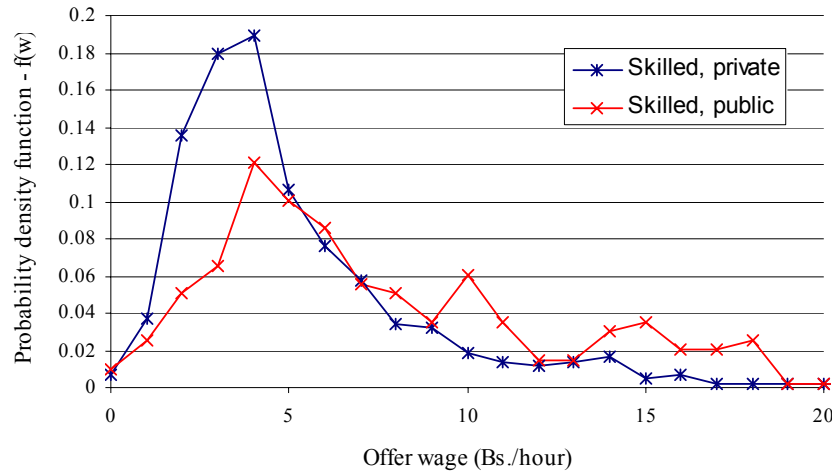
While working for the public or the private sector makes hardly any difference for unskilled workers, there is a big difference for the skilled workers. The average wage offer to a skilled worker in the public sector is 86% higher than the average wage offer to a skilled person in the private sector. This could potentially be explained by a higher proportion of older, better educated, more experienced people in the public sector, but even when looking at very homogeneous sub-groups, such as young (<35 years), skilled employees, we find that wage offers are 84% higher for the public sector. The difference between public and private sector wage offers is biggest among urban, skilled employees, where the public sector offers salaries that, on average, are more than twice as high as those offered by the private sector (see Table 6).

Table 6: Offer wages for different sub-groups of employees (Bs./hour)

Group (# of people in group)	# of movers	Offer wage	
		Mean	St. Dev.
All employees (5868)	1803	5.24	7.16
Skilled (2736)	633	7.74	10.76
Unskilled (3132)	1170	3.88	3.42
Male (4143)	1327	5.23	6.64
Female (1725)	476	5.24	8.46
Urban (4440)	1327	5.53	7.96
Rural (1428)	476	4.45	4.20
Indigenous (2826)	807	4.75	6.37
Non-indigenous (3042)	996	5.63	7.72
Private sector (4126)	1441	4.58	5.65
Public sector (1742)	362	7.87	10.95
Skilled, private sector (1418)	434	6.10	8.59
Skilled, public sector (1318)	199	11.32	13.67
Skilled, young, private sector (977)	350	5.39	8.16
Skilled, young, public sector (571)	137	9.92	13.29
Skilled, older, private sector (441)	84	9.08	9.71
Skilled, older, public sector (747)	62	14.41	14.09
Urban, skilled, private (1298)	390	6.22	8.97
Urban, skilled, public (1035)	153	12.58	14.57
Rural, skilled, private (129)	44	5.07	3.74
Rural, skilled, public (283)	46	7.11	9.04
Unskilled, private sector (2708)	1007	3.92	3.53
Unskilled, public sector (424)	163	3.67	2.57
Open ended contract, private (292)	25	13.93	17.96
Open ended contract, public (1037)	91	12.47	12.71
Time limited contract, private (677)	198	6.42	6.41
Time limited contract, public (356)	140	7.61	12.33
No contract, private (3132)	1218	4.09	4.71
No contract, public (349)	131	4.95	5.94

Apart from higher mean wage offers in the public sector, we also observe a much higher variance of offers. Figure 1 shows that wage offers for skilled workers in the private sector are very much concentrated between Bs. 1 and Bs. 8/hour, while wage offers for skilled workers in the public sector are more spread out with many more observations between Bs. 10 and Bs. 20/hour. Both distributions are extremely skewed, but while the public sector offer distribution has 13% of the distribution between Bs. 20 and Bs. 100, the private sector only has 5%.

Figure 1: Offer wage distributions for skilled workers, by sector (Bs./hour)

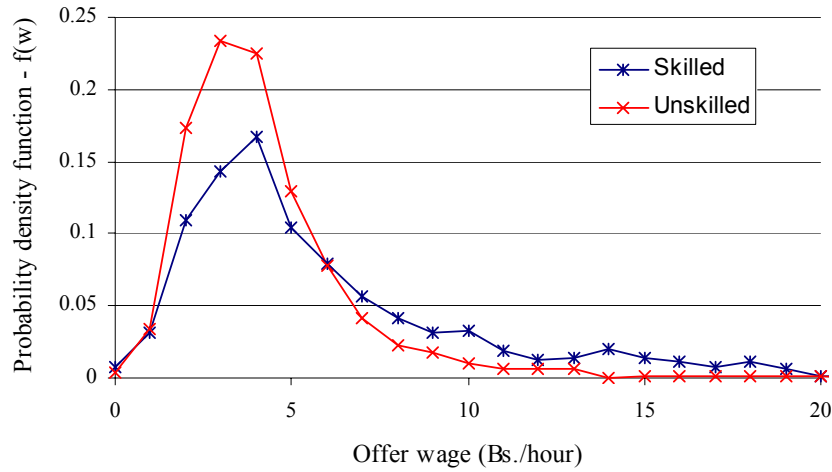


Note: For representation purposes, the distribution is truncated at Bs. 20/hour; however, about 13% of public offer salaries and 5% of private offer salaries were thinly scattered between Bs. 20 and Bs. 100/hour.

The difference in mean wage offers between skilled workers in the public sector and skilled workers in the private sector is very large, indeed, larger than the difference between skilled and unskilled workers (see Figure 2).

The summary statistics presented so far indicate that the public sector in Bolivia not only offers much more attractive salaries than the private sector, but also longer job-durations, and better contracts. With these better contracts come health insurance, job-security, pension contributions, and severance payments. In addition, government employees have substantially shorter working hours. Public sector employees work on average 39.5 hours/week, whereas private sector employees put in 49.5 hours/week, on average.

Figure 2: Offer wage distributions, by skill level (Bs./hour)



*Note:* For representation purposes, the distribution is truncated at Bs. 20/hour; however, about 8% of offer salaries for skilled workers were scattered between Bs. 20 and Bs. 100/hour, while 1% of offer salaries for unskilled workers were scattered between Bs. 20 and Bs. 55/hour.

Given all these advantages of working in the public sector, we would expect that the private sector might have difficulties attracting and retaining qualified labor, at least if qualified labor is a scarce production factor, as many studies on Bolivia show, suggest and/or assume<sup>3</sup>. This is the hypothesis that will be tested in the following section.

#### 4. Estimation results

In this section we will first discuss the results for the simple job separation model. These results will allow us to decompose job separation rates into the part determined by employers (lay-offs) and the part determined by employees (quits). Subsequently, we will report results on the extended job separation model, allowing us to evaluate the wage sensitivity of on-the-job search efforts.

<sup>3</sup> Behrman, Birdsall & Székely (2000), for example, show that the already high wage differentials between skilled and unskilled workers in Latin America has increased further during the structural reforms of the 1990s implying increased scarcity of skilled labor. Andersen & Evia (2003) argue that the large amounts of foreign aid received by the government of Bolivia increases the demand for skilled labor, thus further augmenting the wage gap between skilled and unskilled workers.



## *Layoffs versus quits*

For all employees in the sample, the exogenous job destruction rate (lay-off rate),  $\delta$  is estimated at 0.167 per year, while the offer arrival rate,  $\lambda$ , is estimated at 0.522 per year (see Table 7). The sum,  $\delta + \lambda = 0.689$ , is the predicted job separation rate for the lowest paying job, implying an expected job duration of  $1/0.689 = 1.45$  years or about 17 months for jobs that pay nothing (apprenticeships). For the highest paying job, the probability of receiving a higher offer is zero, so the expected job separation rate would consist only of the exogenous part  $\delta$ , implying an expected job duration of  $1/0.167 = 6$  years.

*Table 7: Parameter estimates for simple job separation model, by contract type*

<b>Group (num.obs)</b>	<b><math>\delta</math></b> (standard error)	<b><math>\lambda</math></b> (standard error)	<b><math>\delta + \lambda</math></b>
Employees (5868)	0.167 *** (0.012)	0.522 *** (0.032)	0.689
Open-ended contract (1354)	0.073 *** (0.015)	0.038 – (0.029)	0.111
Time-limited contract (1033)	0.212 *** (0.032)	0.461 *** (0.078)	0.673
No contract (3481)	0.373 *** (0.023)	0.258 *** (0.047)	0.631

Notes: \*\*\* Significant at the 1% level, \*\* Significant at the 5% level, \* Significant at the 10% level.  
– Not significant even at the 10% level.

Table 7 also shows that the division between exogenous and endogenous job-destruction only exists for employees without contracts or with time-limited contracts. For the employees with open-ended contracts, all job separation is exogenously determined. Those who have landed a secure job with full worker benefits wouldn't dream of giving it up voluntarily.

While the quit rate for employees on open-ended contracts is close to zero, the lay-off rate is also quite low for this group. This implies expected job durations of about 14 years, irrespective of the wage level. In contrast, expected job durations for employees with time-limited or no contracts is only about 18 months, with substantial wage sensitivity.

Table 8 shows the estimated structural parameters of the simple job separation model by skill level. Employees who have completed high school, or have other education of duration at least 12 years, are considered skilled, while the rest is considered unskilled.

While the expected job durations are very similar for the lowest paid employees in each group (about 20 months), the decomposition into lay-offs and quits differ dramatically. For skilled employees, the lay-off rate is only 8.8% per year, while the corresponding number for unskilled employees is 36.7%. In contrast, the offer arrival rate for skilled workers is 50.7% per year, while it is only 22.0% of unskilled workers. This suggests that skilled employees are in relatively short supply, while unskilled workers are in abundant supply.

*Table 8: Parameter estimates for simple job separation model, by skill level*

<b>Group (num.obs)</b>	<b><math>\delta</math></b> (standard error)	<b><math>\lambda</math></b> (standard error)	<b><math>\delta + \lambda</math></b>
Skilled employees (2736)	0.088 *** (0.012)	0.507 *** (0.040)	0.595
Unskilled employees (3132)	0.367 *** (0.024)	0.220 *** (0.048)	0.587

Notes: \*\*\* Significant at the 1% level, \*\* Significant at the 5% level, \* Significant at the 10% level.  
– Not significant even at the 10% level.

Table 9 makes the further distinction between public and private sector employees. It is clear that the job separation rate is much lower for skilled public sector employees than for all other groups. For the lowest paid skilled workers in the public sector, the average job separation rate is only 29% per year, while for the lowest paid skilled workers in the private sector it is 72%. For the highest paid skilled workers the job separation rate is also much higher in the private sector compared to the public sector. This suggests that the public sector in Bolivia is winning the race for scarce skilled workers, at the expense of the private sector.

Table 9: Parameter estimates for simple job separation model, by skill level and sector

Group (num.obs)	$\delta$ (standard error)	$\lambda$ (standard error)	$\delta + \lambda$
Public sector, skilled (1318)	0.084 *** (0.016)	0.204 *** (0.042)	0.288
Public sector, unskilled (424)	0.254 *** (0.054)	0.597 *** (0.040)	0.851
Private sector, skilled (1418)	0.156 *** (0.023)	0.565 *** (0.065)	0.721
Private sector, unskilled (2708)	0.388 *** (0.027)	0.164 ** (0.052)	0.552

Notes: \*\*\* Significant at the 1% level, \*\* Significant at the 5% level, \* Significant at the 10% level.  
– Not significant even at the 10% level.

The last two decades have witnessed enormous changes in the productive systems in Bolivia, and the skills that workers were applying in typical state-run enterprises before the liberalization in 1985 may be less useful in today's privatized, free-market economy. Job-security was relatively high before the liberalization, and we would therefore expect older workers (here defined as 35 years or older) to be less accustomed and less inclined to search for alternative job-opportunities than younger workers. At the same time, we would expect the demand for young, skilled workers to be high, as this is the group most likely to have the skills necessary to run the new style of companies and institutions found in the free-market economy.

Table 10 shows the job separation parameters estimated for skilled workers, by age and sector. As expected, the job separation rate,  $(\delta + \lambda)$ , is considerably higher for young, skilled workers than for older skilled workers, and it is also considerably higher in the private sector than the public sector.

Table 10: Parameter estimates for simple job separation model, skilled employees, by age and sector

Group (num.obs)	$\delta$ (standard error)	$\lambda$ (standard error)	$\delta + \lambda$
Public sector, young (571)	0.169 *** (0.036)	0.256 *** (0.083)	0.425
Public sector, older (747)	0.067 *** (0.019)	0.044 – (0.039)	0.113
Private sector, young (977)	0.243 *** (0.035)	0.498 *** (0.086)	0.741
Private sector, older (441)	0.091 *** (0.029)	0.341 *** (0.086)	0.432

Notes: \*\*\* Significant at the 1% level, \*\* Significant at the 5% level, \* Significant at the 10% level.

– Not significant even at the 10% level.

The quit rate,  $\lambda$ , among young, skilled workers in the private sector is almost 50% per year, where as for young, skilled workers in the public sector it is only about 26% per year. This again supports the hypothesis that the private sector has difficulties competing with the public sector for the most qualified workers.

In the following section, we will test whether the private sector would be able to keep on more of its skilled personnel by increasing wages.

#### *The wage sensitivity of job search*

Table 11 shows the structural parameter estimates for the extended job separation model. For employees in general, we do not get the expected negative sign on  $b$ . Instead we get a significantly positive sign, indicating that higher wages make people more inclined to look for alternative employment and generate alternative job offers. This again suggests that skilled employees are scarce and have alternative employment opportunities available to them, while unskilled employees consider themselves lucky just to have a job, and thus would not give it up voluntarily.

The division between skilled and unskilled employees in Table 10 shows that the positive  $b$  result is indeed fully driven by unskilled people. Skilled people, in contrast, show the expected negative sign for the parameter  $b$ , indicating that the more they are paid, the less likely they are to quit.

*Table 11: Parameter estimates for extended job separation model, by skill level*

<b>Group (num.obs)</b>	<b><math>\delta</math></b> (standard error)	<b><math>a</math></b> (standard error)	<b><math>b</math></b> (standard error)
Employees (5868)	0.096 *** (0.020)	0.398 *** (0.042)	0.094 *** (0.022)
Skilled (2736)	0.228 *** (0.042)	0.632 *** (0.053)	-0.101 *** (0.026)
Unskilled (3132)	0.294 *** (0.035)	0.113 * (0.058)	0.103 *** (0.037)

Notes: \*\*\* Significant at the 1% level, \*\* Significant at the 5% level, \* Significant at the 10% level.

– Not significant even at the 10% level.

This only holds for skilled people in the public sector, however. Table 12 shows that the coefficient  $b$  for skilled people in the private sector is not negative, indicating that employers in the private sector would not be able to retain their skilled workers by increasing wages. This holds for both young and older, indigenous and non-indigenous, rural and urban, male and female skilled workers (results not shown).

*Table 12: Parameter estimates for skilled employees, by sector*

<b>Group (num.obs)</b>	<b><math>\delta</math></b> (standard error)	<b><math>a</math></b> (standard error)	<b><math>b</math></b> (standard error)
Private sector, skilled (1418)	0.137 *** (0.044)	0.539 *** (0.084)	0.020 – (0.022)
Public sector, skilled (1318)	0.325 *** (0.062)	0.302 ** (0.058)	-0.094 *** (0.020)

*Notes:* \*\*\* Significant at the 1% level, \*\* Significant at the 5% level, \* Significant at the 10% level.

– Not significant even at the 10% level.

This confirms the hypothesis that the private sector has serious difficulties competing with the public sector when it comes to attracting and keeping skilled labor. Even if the private sector increased salaries (thus compromising competitiveness), skilled workers would still be difficult to retain, as they tend to be constantly looking for better job offers.

## 5. Conclusions

This paper estimates structural parameters of both a simple and an extended job separation model, with the purpose of understanding constraints in the labor market in Bolivia. The results clearly confirm the hypothesis that skilled labor is scarce in Bolivia, while unskilled labor is abundantly available. This implies that skilled employees shop around for alternative employment opportunities and quit their jobs when a better opportunity arises. Unskilled workers, on the other hand, consider themselves very lucky just to be employed, and are much less likely to engage in on-the-job search. They know that there is a very large pool of unemployed, under-employed, or self-employed, unskilled people who would be very happy to have a regularly paying job, no matter how low the salary might be.

The quit rate among skilled employees in the private sector is much higher than the quit rate among skilled employees in the public sector. The reverse is true for the lay-off

rate, and together this suggests that the private sector has difficulties maintaining its skilled labor. The private sector might try to improve its capacity to retain skilled employees by increasing wages, but the wage sensitivity parameters estimated in this paper suggest that this is not going to work – skilled employees in the private sector do not seem to reduce their on-the-job search in response to higher wages.

These results provide empirical evidence that the public sector in Bolivia, artificially inflated by high levels of foreign aid (about 10% of GDP), may be detracting scarce human resources away from local productive sectors, to the detriment of sustainable development.

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